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Scientific and Technical Aerospace Reports (STAR) is a comprehensive abstracting and indexing service devoted solely to report literature bearing on the science and technology of aeronautics and space. Published twice each month, commencing in 1963, *STAR* is the successor to *Technical Publications Announcements* and provides coverage of:

(1) scientific and technical reports of the National Aeronautics and Space Administration and its contractors;

(2) scientific and technical reports of government agencies, universities, and industrial and independent research organizations in the United States and abroad; and

(3) scientific and technical articles prepared by NASA and contractor authors which appear in learned and technical journals.

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STAR is arranged in two major sections. The first contains complete bibliographic citations with informative abstracts, arranged by appropriate subject categories to facilitate scanning. The second section comprises five indexes: Subject, Corporate Source, Personal Author, Report Number, and Accession Number. Separate cumulative indexes are published quarterly, semiannually, and annually.

Each abstract is prefixed by the NASA accession number, and the separate indexes contain explanatory notes which guide the user to the desired abstract.

Further information concerning the content, format, publication, and availability of *Scientific and Technical Aerospace Reports* can be obtained by writing to the National Aeronautics and Space Administration, Office of Scientific and Technical Information, Washington 25, D. C. Information regarding the availability of *IAA* may be obtained from the Institute of Aerospace Sciences, 750 Third Avenue, New York 17, New York. NASA contractors, subcontractors, and grantees should transmit their requests for both *STAR* and *IAA* directly to the NASA address.

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For related information see: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; and 11 Fluid Mechanics

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VOLUME 1 NUMBER 4

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

February 23, 1963

01 GENERAL

Includes: management; space law and legal matters; symposia or conferences of a broad or a general nature.

N63-11562 National Academy of Sciences. Space Science Board, Washington, D.C.

A REVIEW OF SPACE RESEARCH

H. H. Hess et al 1962 584 p 16 refs Report of the Summer Study conducted at the State University of Iowa, Iowa City, June 17-Aug. 10, 1962

(Supported by NASA Grant)

(NAS/NRC 1079) OTS: $26.00 ph, $17.72 mf

A review of the primary problems in space research in each major scientific area, and of the policies and procedures guiding the future national space effort is presented. The findings and recommendations of the various working groups attending the Summer Study of the Space Science Board are presented in the following areas: flight program of satellites and space probes; flight program of rockets, balloons and high-altitude aircraft; ground-based research activities; science in the manned spaceflight program; administrative and policy matters; international cooperation; and social implications of space activities. M.P.G.

N63-11576 United Research, Inc., Cambridge, Mass.

ECONOMIC CRITERIA FOR FEDERAL AVIATION AGENCY EXPENDITURES Final Report

Gary Fromm June 1962 264 p 73 refs

(Contract FAA/BRD-355)

The purpose of this study was to determine certain broad principles and economic criteria for Federal Aviation Agency expenditures. These criteria enable the Agency to establish specific standards and techniques for evaluating overall and particular research and development, investment, and operating programs, commensurate with the nation's future requirements and capabilities. In addition, these criteria were to be applied to the current aviation support system, and a measurement taken of the present and future benefits of improving Federal Aviation Agency effectiveness. Author

N63-11649 Royal Netherlands Aircraft Factories Fokker, Amsterdam

AGENDA OF F.27 FRIENDSHIP SECOND OPERATORS CONFERENCE TO BE HELD SEPTEMBER 1962

[Aug. 1962] 150 p

This report covers the following: general information on operation, performance, and maintenance; aircraft structure; flight controls; landing gear; powerplant controls; propeller installation; fuel and water/methanol system; pneumatic system; radio frequency; air-conditioning and pressurization; instruments; autopilot; and furnishings. J.R.C.

N63-11650 Gt. Brit. Ministry of Aviation. Technical Information and Library Services, Mottingham

DEFINITIONS FOR EXPLOSIVE AND SIMILAR MATERIALS (BEGRIFFSBESTIMMUNGEN FUER SPRENGSTOFFE UND AEHNLICHE STOFFE)

H. Koenen and H. Freytag Oct. 1962 4 p Transl. from Arbeitsschutz (Cologne), (9), 1959 p 204-205

(TIL/T-5193)

A discussion is presented of the meaning of the terms used in legal statutes in Germany as related to these materials. The distinction between substances easily and difficultly exploded is discussed in relation to test methods and transport regulations. Examples are listed of each category. Author

N63-11655 Naval Research Lab., Washington, D.C.

REPORT OF NRL PROGRESS

Dec. 1962 52 p 31 refs

OTS: $1.25

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1. THE ADHESION OF ICE TO LUBRICATED SURFACES H. R. Baker, W. D. Bascom, and C. R. Singleterry p 1-6 10 refs (See N63-11656 04-07)
2. ELECTROFRACTURE J. W. Davisson and W. H. Vaughn p 7-17 4 refs (See N63-11657 04-25)

N63-11658 Congress. House. Committee on Science and Astronautics

1963 NASA AUTHORIZATION, PART 1 [No. 2] Hearings before the Committee on Science and Astronautics, U.S. House of Representatives, Feb. 27, 28, April 12, and May 3, 1962

Washington, GPO, 1962 230 p

(87th Cong. 2nd Sess. Committee Print) GPO: $0.65

This is a four-part review of the hearings before the Committee on Science and Astronautics of the U.S. House of Representatives. In the first part, the NASA budget estimate for 1963 is announced, and work accomplished in 1962 is reviewed. The second part attempts to present as complete and accurate a picture as possible of the management phase of the NASA space program. In the third part, hearings on the proposed NASA research program are presented before the Subcommittee on Advanced Research and Technology. The purpose here is to make sure that an adequate and well-balanced

advanced NASA research program is authorized by Congress to ensure achievement of national goals and objectives in science and aeronautics. Part four reviews the programs and required expenditures of the National Aeronautics and Space Administration. A.S.

N63-11659 Congress. House. Committee on Science and Astronautics

1963 NASA AUTHORIZATION, PART 2 [No. 2] Hearings before the Subcommittee on Manned Space Flight of the Committee on Science and Astronautics, U.S. House of Representatives, Mar. 6, 7, 8, 14, 20, 26, 27, 28, 29; Apr. 2, 3, 4, 5, and 10, 1962

Washington, GPO, 1962 923 p For abstract see N63-11658 04-01

(87th Cong. 2nd Sess. Committee Print) GPO: $3.00

N63-11660 Congress. House. Committee on Science and Astronautics

1963 NASA AUTHORIZATION, PART 3 [No. 2] Hearings before the Subcommittee on Advanced Research and Technology of the Committee on Science and Astronautics, U.S. House of Representatives, Mar. 7, 8, 13, 14, 15, 16, 20, 23, 27, 28, 29, and Apr. 3, 1962

Washington, GPO, 1962 531 p For abstract see N63-11658 04-01

(87th Cong. 2nd. Sess. Committee Print) GPO: $1.75

N63-11661 Congress. House. Committee on Science and Astronautics

1963 NASA AUTHORIZATION, PART 4 [No. 2] Hearings before the Subcommittee on Space Sciences of the Committee on Science and Astronautics, U.S. House of Representatives, Mar. 6, 7, 8, 13, 19, and 20, 1962

Washington, GPO, 1962 923 p For abstract see N63-11658 04-01

(87th Cong. 2nd Sess. Committee Print) GPO: $0.75

N63-11687 Polytechnic Inst. of Brooklyn. Microwave Research Inst., N.Y.

A SUMMARY OF CURRENT RESEARCH AT THE MICROWAVE RESEARCH INSTITUTE Progress Report No. 22, 1 Apr. 1962 through 30 Sept. 1962

Ernst Weber et al [1962] 185 p refs

(Grant AF-AFOSR-62-295; former Contract AF 18(600)-1505) (R-452-22-62)

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N63-11723 Congress. House. Committee on Science and Astronautics

PANEL ON SCIENCE AND TECHNOLOGY, FOURTH MEETING Hearings before the Committee on Science and Astronautics, U. S. House of Representatives, March 21 and 22, 1962

Washington, GPO, 1962 113 p

(87th Cong. 2nd Sess. Committee Print [No. 3])

The hearings included discussions on: rocket engines, radio-astronomy, and the feasibility of a geodetic satellite. I.v.L.

N63-11724 Congress. House. Committee on Science and Astronautics

OWNERSHIP OF INVENTIONS DEVELOPED IN THE COURSE OF FEDERAL SPACE RESEARCH CONTRACTS Report of the Subcommittee on Patents and Scientific Inventions of the Committee on Science and Astronautics, U.S. House of Representatives

Washington, GPO, Apr. 5, 1962 31 p

(87th Cong. 2nd Sess. Committee Print)

An amendment to the patent section of the National Aeronautics and Space Act of 1958 is proposed. The advantages of such an amendment are: (1) No private party can gain a monopoly on important technological developments. The administrator must be satisfied with a royalty-free license unless he can show that those interested demand greater rights. Also, the administrator is given specific criteria to help him determine whether to acquire greater rights than those given the license; (2) The administrator can defer decisions on the title question, if necessary, until after the disclosure of the inventions; (3) The administrator can require licensing of potentially useful inventions which have been left undeveloped and unlicensed for a period of 5 years. The risk that scientific developments enhanced by Federal funds will not be put to work commercially for the benefit of the consumer public will be minimized. I.v.L.

N63-11725 Congress. House. Committee on Science and Astronautics

DEVELOPMENT OF LARGE SOLID PROPELLANT BOOSTERS Hearings before the Special Subcommittee on Propulsion of the Committee on Science and Astronautics, U. S. House of Representatives, August 8 and 9, 1962

Thomas F. Dixon (NASA), William Cohen (NASA), Bernard A. Schriever, and Lawrence L. Kavanau Washington, GPO, 1962 74 p

(87th Congress. 2nd Sess. Committee Print [No. 10])

These hearings cover the program for development of large solid-propellant boosters. The segmented 156-inch motor and the 240-inch monolithic motor are discussed. R.C.M.

N63-11726 Congress. House. Committee on Science and Astronautics

PROJECT ADVENT—MILITARY COMMUNICATIONS SATELLITE PROGRAM Hearings before the Subcommittee on Space Sciences of the Committee on Sciences and Astronautics, U. S. House of Representatives, August 15 and 17, 1962

Finn J. Larsen et al Washington, GPO, 1962 143 p

(87th Cong. 2nd Sess. Committee Print [No. 13])

Hearings were held before the Space Sciences Subcommittee to determine the present status and future development plans for the Advent equatorial orbit communications satellite, and to investigate the extent to which the delay in the Centaur program affected the Advent program. Military communications requirements were discussed in relation to civilian needs to determine which military requirements could be satisfied by a commercial communications satellite system. M.P.G.

N63-11728 Congress. House. Committee on Science and Astronautics

COMMUNICATIONS SATELLITE EXPERIMENTS Report of the Committee on Science and Astronautics, U. S. House of Representatives, Serial V

Washington, GPO, 1962 14 p
(87th Cong. 2nd Sess. H. R. 2560 Committee Print)

Status of communications satellite experiments is covered with emphasis on the Syncom, Relay, and Telstar satellites. The aspects of cost, the need for a military communications satellite, and data on the impact of Telstar on the public are also discussed. A.S.

N63-11804 Congress. House. Committee on Science and Astronautics

PATENT POLICIES RELATING TO AERONAUTICAL AND SPACE RESEARCH Hearings before the Special Subcommittee on Patents and Scientific Inventions of the Committee on Science and Astronautics, U. S. House of Representatives, January 29, 31, February 1, 2, and 8, 1962

Franklin O. Davis et al Washington, GPO, 1962 250 p
(87th Cong. 2nd Sess. Committee Print [No. 1] Part 2)

Congressional hearings were held on patent policies relating to aeronautical and space research before the Subcommittee on Patents and Scientific Inventions. These hearings were a continuation of previous hearings which resulted in a recommendation that the patent section of the National Aeronautics and Space Act be liberalized to give the NASA administrator the option of acquiring title to inventions arising under NASA contracts instead of requiring that he do so. Although the hearings deal specifically with patents arising from the space program, the question of ownership of patent rights under Federal research contracts is considered to have broad implication for all Federal agencies. M.P.G.

N63-11808 Air Force Communications Service. North Atlantic Communications Region, Westover AFB, Mass.

NORLANT PROGRAMMING PLAN NR. 24 FOR REORGANIZATION OF CONUS COMMUNICATIONS REGIONS

James T. Mc Elhone Jan. 15, 1963 50 p

This report on NORLANT (North Atlantic Communications Region) plan Nr-24 for reorganization of CONUS communications regions covers the following: concept of operations, flight facilities, telecommunications, logistics, administration and personnel, comptroller, time phase schedules, and safety and security. J.R.C.

N63-11929 Department of State. Telecommunications Div., Washington, D.C.

REPORT OF THE UNITED STATES DELEGATION TO THE MEETING OF INTERNATIONAL RADIO CONSULTATIVE COMMITTEE (CCIR). STUDY GROUP IV—SPACE SYSTEMS, WASHINGTON, D.C., MARCH 12-23, 1962

John P. Hagen May 23, 1962 38 p
(TD-937; CCIR-35)

The most significant result of the meeting was the acceptance of the U.S. report on the Feasibility of Sharing between Communications Satellite Relays and Terrestrial Microwave Relays. The implications of this report and its impact on the EARC (Extraordinary Administrative Radio Conference) of 1963 are very great. Without international acceptance of this report, massive reorganization of the allocation of the radio spectrum would have been a required action of the EARC to make communication by satellites feasible. I.v.L.

02 AERODYNAMICS OF BODIES, COMBINATIONS, AND INTERNAL FLOW

Includes: aerodynamics of channels, cowls, ducts, ejectors, nozzles, etc.

For related information see: 03 Aerodynamics of Wings, Rotors and Control Surfaces; and 11 Fluid Mechanics.

N63-11617 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

AERODYNAMIC CHARACTERISTICS IN GROUND EFFECT OF A LARGE-SCALE MODEL WITH A HIGH DISK-LOADING LIFTING FAN MOUNTED IN THE FUSELAGE

Richard A. deSavigny and David H. Hickey Washington, NASA, Jan. 1963 52 p 5 refs
(NASA TN D-1557) OTS: $1.50

The large-scale VTOL airplane model tested had a shoulder-mounted unswept-wing-of-aspect ratio 5. Characteristics of the model with and without the horizontal tail were obtained with the wing at 1.83 and 2.39 fan diameters from the simulated ground plane installed above the wind-tunnel floor. Test airspeeds ranged from 20 to 80 knots. Longitudinal forces and moments, some installed fan performance, static-pressure distributions on the fuselage, and downwash at the horizontal tail are presented. Author

N63-11625 David Taylor Model Basin. Aerodynamics Lab., Washington, D.C.

HOVERING AND WIND-TUNNEL INVESTIGATIONS OF THE DAVID TAYLOR MODEL BASIN 3-FOOT-DIAMETER POWERED ANNULAR JET MODEL 430

Arthur E. Johnson Oct. 1962 22 p 9 refs
(DTMB-1679; DTMB-AERO-1041)

Hovering characteristics are presented for a 3-foot-diameter annular jet GEM having secondary stabilizing jets. Hovering efficiency approaching that predicted for highly developed GEM's was attained by careful design of internal flow passages. Brief wind-tunnel results, showing the general effects of speed, are also presented. Author

N63-11779 National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

JET EFFECTS ON ANNULAR BASE PRESSURE AND TEMPERATURE IN A SUPERSONIC STREAM

Milton A. Beheim, John L. Klann, and Richard A. Yeager Washington, NASA, 1962 42 p 15 refs
(NASA TR R-125) GPO: $0.55

The theoretical and experimental investigation was conducted with single jet configurations at free-stream Mach numbers of 2.0 and 1.6. Theoretical base-pressure ratios were generally less than experimental values, but were in closer agreement for the short-nozzle designs than for the full-length isentropic nozzles. In general, the predicted base-temperature ratios were greater than experimental values, and this deviation decreased with increasing ratio of jet total to base static pressure. This deviation was less at Mach 1.6 than at 2.0, and was less for high-area-ratio nozzles than for low-area-ratio designs. The effect of base bleed on base pressure could be predicted with good accuracy at low bleed-flow rates. Author

N63-11846 National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AERODYNAMIC CHARACTERISTICS OF FOUR-DUCT TANDEM VTOL-AIRCRAFT CONFIGURATIONS

William A. Newsom, Jr. Washington, NASA, Jan. 1963 152 p 2 refs
(NASA TN D-1481) OTS: $3.00

This paper presents a summary of several wind-tunnel investigations conducted for the study of four similar VTOL-aircraft configurations, powered by four tilting ducted propellers arranged in tandem pairs. The results of the investigation indicated that aircraft of this type could have acceptable aerodynamic and static longitudinal- and lateral-stability characteristics in both transition and cruise flight. However, the lateral force due to sideslip was abnormally high and might have caused the aircraft to be too sensitive to side gusts. Author

X63-11861 Minnesota U. Rosemount Aeronautical Labs., Minneapolis

WIND TUNNEL INVESTIGATION OF AERODYNAMICS OF SLIPPER BEAMS AS MOUNTED ON A TYPICAL SUPERSONIC ROCKET SLED

Frederick Moynihan and Rudolf Hermann Holloman AFB, N. Mex., Directorate of Research Analyses, Oct. 1962 42 p 4 refs
(Contract AF 29(600)-2839)
(RAL-RR-190; AFOSR/DRA-62-19)

Results of wind-tunnel measurements of lift and drag of slipper beams when mounted on a basic sled configuration are presented and discussed. The pressure distributions on the top and the bottom of the sled body are also presented. Variables investigated were location of front slipper beam and front- and rear-beam fairing shapes. The results show that the slipper-beam lift characteristics can predominate, but by proper shape and location the overall sled lift can be effectively controlled. Author

N63-11902 Aeronautical Research Council (Gt. Brit.)

FREE-FLIGHT MEASUREMENTS OF PRESSURE DISTRIBUTION AT TRANSONIC AND SUPERSONIC SPEEDS ON BODIES OF REVOLUTION HAVING PARABOLIC AFTERBODIES

C. Kell London, HMSO, 1962 23 p 5 refs
(ARC-R&M-3290; previously issued as RAE-AERO 2605; ARC-20433)
Available from HMSO: 9s. 6d.

Free-flight measurements have been made of the pressure distributions over a series of related afterbodies attached to a common cone-cylinder body of revolution. The Mach number range covered was from 0·9 to 1·5 and the Reynolds number range from 31 to 65 × 10^6. The experimental results were in reasonable agreement with theoretical values calculated by the method of characteristics and confirm the usefulness of the supersonic similarity law as a means of predicting drag. Measurements of base pressure were qualitatively in agreement with estimates, but quantitatively the agreement was not good. Limitations in the experimental technique and in certain cases the occurrence of flow separation are jointly held responsible for the discrepancies. The measured boundary-layer displacement thicknesses on the afterbody were in good agreement with estimated values.
Author

N63-11909 National Aeronautical Lab., Tokyo (Japan)

PRELIMINARY TEST OF SUPERSONIC NOZZLES FOR THE SUPERSONIC BLOW-DOWN WIND TUNNEL

1962 20 p 12 refs In Japanese
(NAL-TR-26)

The design and performance of nozzles for use in a supersonic blowdown wind tunnel were investigated. The nozzles, made of solid pieces joined together with a flexible sheet, performed satisfactorily in the range from Mach 1.4 to Mach 3 where the wind-speed uniformity was within ±5% of the required speed. However, at Mach 4 and Mach 4.5, a decrease in wind speed was measured which could not be explained by the air drag on the surface of the model. Author

03 AERODYNAMICS OF WINGS, ROTORS, AND CONTROL SURFACES

Includes: ailerons; airfoil sections; cascades; fans; flaps; propellers; rotors; slats; spoilers; etc.

For related information see: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; and 11 Fluid Mechanics.

N63-11614 National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AN INTEGRAL EQUATION RELATING THE GENERAL TIME-DEPENDENT LIFT AND DOWNWASH DISTRIBUTIONS OF FINITE WINGS IN SUBSONIC FLOW

Joseph A. Drischler Washington, NASA, Jan. 1963 19 p 13 refs
(NASA TN D-1521) OTS: $0.50

The equation is applicable for any arbitrary time-dependent motion and can be utilized for flexible as well as rigid wings. The form of the equation is such that it should lend itself readily to modern high-speed computers for obtaining pressure distributions. Special cases of the integral equation are treated for two-dimensional incompressible flow and are presented in an appendix. The kernel function for oscillating finite wings in subsonic flow is obtained as a special case of the integral equation. Author

N63-11746 Cornell Aeronautical Lab., Inc., Buffalo, N.Y.

A METHOD FOR COMPUTING ROTARY WING AIRLOAD DISTRIBUTION IN FORWARD FLIGHT Technical Report [Sept. 1960-Apr. 1962]

Raymond A. Piziali and Frank A. Du Waldt Nov. 1962 74 p 38 refs
(Contract DA 44-177-TC-698)
(CAL-BB-1495-S-1; TCREC-TR-62-44)

A solution to the airloads problem for a rotating wing in steady-state translational flight is obtained. A sufficient amount of the wake detail was retained to enable accurate computation of the wake-induced velocities at the blades and, thus, the airload distribution. The method is used to compute the airload distribution for several rotors, and measured and computed airloads are compared. In general, the agreement is quite good. Author

N63-11832 National Aero- and Astronautical Research Inst., Amsterdam (Netherlands)

[AIRWORTHINESS STUDIES. AERODYNAMIC CHARACTERISTICS OF FLAT PANELS, WEDGE-SHAPED PLATES, AND OSCILLATING RECTANGULAR WINGS IN SUPERSONIC FLOW]

J. P. Benthem et al 1962 126 p 39 refs
(Performed under contract with Netherlands Aircraft Development Board and Netherlands Civil Aviation Department)
(*Its* Reports and Transactions, v. 26, 1962; NLL-TR-S.527; NLL-TR-S.529; NLL-TR-S.542; NLR-TR-W.3; NLR-TR-W.5)

CONTENTS:

1. THE BUCKLING LOAD OF FLAT PANELS THAT CHANGE IN THICKNESS ACROSS THE BAY J. P. Benthem p 1-8 6 refs
2. AIRPLANE LOADS IN PITCHING MANOEUVERS B. Hakkeling p 9-39 7 refs
3. A STRESS DIFFUSION PROBLEM FOR A WEDGE-SHAPED PLATE WITH THREE STIFFENERS J. P. Benthem and J. Van Der Vooren p 41-70 9 refs
4. OSCILLATING RECTANGULAR WINGS IN SUPERSONIC FLOW WITH ARBITRARY BENDING AND TORSION MODE SHAPES PART I DEVELOPMENT OF THE THEORY E. M. De Jager p 71-101 13 refs
5. OSCILLATING RECTANGULAR WINGS IN SUPERSONIC FLOW WITH ARBITRARY BENDING AND TORSION MODE SHAPES PART II NUMERICAL RESULTS E. M. De Jager p 103-124 4 refs

N63-11838 Advisory Group for Aeronautical Research and Development, Paris (France)

INTERACTION DES DÉCOLLEMENTS AU BORD DE FUITE ET DE BORD D'ATTAQUE EN ÉCOULEMENT TRIDIMENSIONNEL [THE INTERACTIONS OF (FLOW) DETACHMENTS AT THE TRAILING EDGE AND THE ATTACK EDGE IN THREE DIMENSIONAL FLOW]

E. A. Eichelbrenner Apr. 1960 18 p 7 refs In French; English Summary
(AGARD-275)

The separation phenomena, called excrescences, which occur at the leading edge of wings with sharp leading edges or small radius of curvature, are considered to be essentially three-dimensional. The development of excrescences in relation to incidence was studied in wind-tunnel tests. For annular wings, the three-dimensional boundary layers corresponding to the three types of incidence (low angles of attack, mean angles of attack, and high angles of attack) were characterized. The case of a slender wing at high angles of attack was found to produce a shear flow leading to pronounced lateral vortices and wing stall. This stall can be avoided by eliminating or reducing the excrescence by adapting the three-dimensional camber of the leading edge to suit the local incidence. The effectiveness of this method was confirmed in wind-tunnel tests. M.P.G.

N63-11901 Aeronautical Research Council (Gt. Brit.)
AN INVESTIGATION OF THE FLOW ABOUT A PLANE HALF-WING OF CROPPED-DELTA PLANFORM AND 6 PER CENT SYMMETRICAL SECTION AT STREAM MACH NUMBERS BETWEEN 0.8 AND 1.41
E. W. E. Rogers, I. M. Hall, and C. J. Berry (Natl. Phys. Lab.) London, HMSO, 1962 88 p 10 refs
(ARC-R&M-3286; previously issued as ARC-22191) Available from HMSO: £ 1. 14s.

The developing flow patterns with incidence and Mach number are analyzed and related to the observed surface-pressure distributions and measured wing forces. Conditions for shock-induced and leading-edge types of separation are sought, and a brief comparison is made of the effects of cropping the wing tip. Author

N63-11903 Aeronautical Research Council (Gt. Brit.)
THE AERODYNAMIC FORCES ON AN OSCILLATING TWO-DIMENSIONAL WING IN ACCELERATED SUPERSONIC FLIGHT
D. E. Davies London, HMSO, 1962 11 p 1 ref
(ARC-R&M-3299; previously issued as RAE-R-STRUCT-262, ARC-23019) Available from HMSO: 5s.

The lift distribution on a two-dimensional wing oscillating in accelerated flight is obtained by solving the linearized partial-differential equation for the velocity potential in the fluid flow about the wing and applying the linearized Bernoulli equation. Expressions for the total lift and moment are obtained as integrals involving the upwash on the wing. Numerical values for the lift and moment on a heaving wing and on a pitching wing have been obtained when the forward acceleration of the wing is uniform. Author

N63-11907 National Aeronautical Lab., Tokyo (Japan)
STUDIES OF THE SMALL DISTURBANCE THEORY OF TRANSONIC FLOW (I)—NONLINEAR CORRECTION THEORY
Iwao Hosokawa July 1962 31 p 14 refs
(NAL-TR-97)

In order to approach to the flow near thin wings and bodies flying at transonic speed, the small disturbance theory of transonic flow theory is studied from a new point of view. First, the mathematical ground of the linearized transonic flow theory originating with Oswatitsch is investigated by introduction of the correction term for complementing the linearized flow field, and therefrom a more exact and reasonable method of approximation is developed. Two examples of approximation of the method are given; about the flows past a wavy wall and on a circular-arc aerofoil with various free stream Mach numbers. As a result, it turns out that the present theory can reveal many plausible general features of transonic flows. Author

N63-11910 National Aeronautical Lab., Tokyo (Japan)
AN APPROXIMATE ANALYSIS FOR UNSTEADY TRANSONIC FLOW
Iwao Hosokawa and Hajime Miyoshi 1962 21 p 10 refs In Japanese; English abstract
(NAL-TR-27)

First, a theory of unsteady transonic flow is established on the basis of approximate treatment of the nonlinear equation of the small disturbance theory of unsteady transonic flow. The nonlinear correction theory which the author devised as the approximate method of treating the steady transonic flow is utilized in the theoretical procedure. Second, as an example of application, the problem of a biconvex circular-arc aerofoil pitching and vertically oscillating periodically at sonic speed ($M_\infty = 1$) is dealt with. The result of calculation is compared with Nelson and Berman's based on the linear theory of unsteady flow, and found to be more reasonable in the whole region of the reduced frequency k. Author

N63-11925 Aeronautical Research Council (Gt. Brit.)
SURFACE OIL-FLOW PATTERNS ON WINGS OF DIFFERENT LEADING-EDGE RADIUS AND SWEEPBACK
H. C. Garner and D. K. Cox (Nat'l. Phys. Lab.) London, HMSO, 1962 25 p 10 refs
(CP-583; previously issued as NPL/Aero/415; ARC-22814) Available from HMSO: 5s. 6d.

Oil-flow patterns have been studied on a series of models having four different angles of sweepback and four profiles of different nose radius. The patterns show that the phenomenon of leading-edge flow reversal is hardly influenced by nose radius. Numerical analysis leads to a rough formula for the range of incidence during which the origin of the leading-edge vortex traverses the leading edge from tip to root. Author

04 AIRCRAFT

Includes: specific types of complete aircraft (e.g., Ground Effects Machines, Flexible Wings, STOL, and VTOL); flight tests; operating problems; stability and control.

For related information see: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings, Rotors, and Control Surfaces; and 30 Space Vehicles.

N63-11714 Royal Netherlands Aircraft Factories Fokker, Amsterdam
SIMPLIFIED CALCULATION OF THE EFFECT OF NOSE GEAR SLAP-DOWN FOR A CERTAIN UNCONVENTIONAL u/c LAY-OUT
W. J. v. Hooff Feb. 1, 1962 17 p
(LW intern 27)

The energy distribution between the main and nose wheels (mounted in an unconventional undercarriage arrangement) was calculated for a two-point landing of a specific aircraft configuration. Parameter variation was investigated. The purpose was to determine whether certain two-point landing conditions with the 3-element landing gear of this aircraft would result in an energy absorption that deviates far from that of a conventional landing. It was concluded that: (1) In landings where the main and nose undercarriages contact the ground at different instants, the energy distribution differs from that of a 3-point landing. (2) The influence of spin-up effects on the energy distribution between nose and main undercarriages decreases with increasing descent velocity. For the particular aircraft studied, the worst energy distribution between main

and nose undercarriages is of the order of 40% to 60% for all landing speeds and at the maximum descent velocity. This conclusion is valid if the time interval between impact of main and nose undercarriages does not exceed 0.4 sec. A.S.

N63-11715 Royal Netherlands Aircraft Factories Fokker, Amsterdam
THE PHENOMENA OF PREMATURE ADF POINTER REVERSALS
A. Mulder Jan. 11, 1962 27 p 7 refs
(UE-27-139)

This report presents an analysis of the specific factors which govern the in-flight accuracy of beacon overhead indications. As a result, it defines at which tuning frequency and flying altitude the most remote premature pointer reversal will occur. Author

N63-11749 Bell Helicopter Co., Fort Worth, Tex.
A STUDY OF THE ORIGIN AND MEANS OF REDUCING HELICOPTER NOISE
R. C. Cox and R. R. Lynn Nov. 1962 107 p 20 refs
(Contract DA 44-177-TC-729)
(Rept. 299-099-180; TCREC-TR-62-73)

An experimental and analytical investigation of helicopter noise and the means for its reduction are presented. Acoustical and rotor blade air-load data of the single rotor HU-1A helicopter are analyzed. The prominent external noise sources of the test vehicle are identified, and trends associated with various rotor parameters are defined. Specific noise-reduction modifications to the test vehicle are discussed. The optimum modifications to the HU-1A helicopter are shown to be a new four-bladed tail rotor with a larger chord HU-1B main rotor, both operating at reduced tip speed. With these modifications, the noise of the helicopter is reduced approximately 40 percent and the performance is slightly increased. Author

N63-11761 Air Force Flight Test Center, Edwards AFB, Calif.
THE EXPERIMENTAL ROCKET RESEARCH AIRCRAFT PROGRAM, 1946-1962
[1962] 71 p 104 refs
(AFSC Historical Publ. Ser. 62-110 V)

This development and flight-performance review of rocket research aircraft encompasses the X-1 series, Douglas D-558-II, XF-91 rocket powered interceptor, X-2, and X-15. I.v.L.

N63-11785 Systems Technology, Inc., Inglewood, Calif.
HANDLING QUALITIES IN SINGLE-LOOP ROLL TRACKING TASKS: THEORY AND SIMULATOR EXPERIMENTS [Final] Report
T. S. Durand and H. R. Jex Wright-Patterson AFB, Ohio, Flight Control Lab., Nov. 1962 89 p 18 refs
(Contract AF 33(616)-7866)
(ASD-TDR-62-507)

The systems analysis theory of aircraft handling qualities is applied to the task of closed-loop compensatory roll tracking by ailerons alone, and exploratory experiments in a fixed-base simulator are used to verify and refine the theory. The key theoretical parameters evolved are: dominant closed-loop spiral-roll mode frequency and damping ratio; average Dutch-roll frequency; Dutch-roll frequency ratio; uncompensated closed-loop Dutch-roll damping ratio; and Dutch-roll phase dip. The simulator results corroborated the theory and gave specific values for the variation in ratings and performance with these parameters. Author

05 ASTRONOMY AND ASTROPHYSICS

Includes: celestial mechanics; and radioastronomy.

For related information see: 12 Geophysics; and 29 Space Sciences.

N63-11545 Joint Publications Research Service, Washington, D.C.
NEWS OF HIGHER EDUCATIONAL INSTITUTIONS, MINISTRY OF HIGHER AND SECONDARY SPECIALIZED EDUCATION USSR, RADIOPHYSICS SERIES
Dec. 31, 1962 486 p 193 refs Transl. of 30 articles from Izvest. Vyssh. Ucheb. Zaved., Radiofizika (Gor'kiy, USSR), v. 5, no. 4, 1962 p 623-826
(JPRS-16917) OTS: $23.50

CONTENTS:

1. USE OF AN ABSOLUTE ASTRONOMICAL METHOD FOR CALIBRATION OF SMALL ANTENNAS AT CENTIMETER WAVELENGTHS V. S. Troitskiy and N. M. Tseytlin (Sci. Res. Radiophys. Inst., Gor'kiy U.) p 1-13 6 refs (See N63-11546 04-05)
2. RESTORATION IN RADIO ASTRONOMY BY APPROXIMATE METHODS A. Balklav (Astrophys. Lab., Acad. of Sci. Latvian SSR) p 14-38 11 refs (See N63-11547 04-05)
3. ON THE POSSIBILITY OF CONSTRUCTION OF A COORDINATE TRANSFORMER OF HIGHER ACCURACY FOR A TRACKING SYSTEM OF A RADIO TELESCOPE G. G. Basistov (Phys. Inst. im. P. N. Lebedev, Acad. of Sci. USSR) p 39-50 7 refs (See N63-11548 04-05)
4. TRIPARTITE RADIO INTERFEROMETER V. I. Babiy and A. G. Sukhovey (Phys. Inst. im. P. N. Lebedev, Acad. of Sci. USSR) p 397-402 5 refs (See N63-11549 04-05)
5. CHOICE OF TIME CONSTANT FOR A RADIO INTERFEROMETER V. I. Babiy (Phys. Inst. im. P. N. Lebedev, Acad. of Sci. USSR) p 403-405 (See N63-11550 04-05)
6. PRECISION MEASUREMENT OF RADIO EMISSION OF THE MOON ON $\lambda = 3.2$ cm L. N. Bondar, M. R. Zelinskaya, V. A. Porfir'yev, and K. M. Strezhneva (Sci. Res. Radiophys. Inst., Gor'kiy U.) p 406-412 2 refs (See N63-11551 04-05)
7. OBSERVATIONS WITH THE LARGE PULKOVA RADIO CELESCOPE ON $\lambda = 33$ cm BEYOND THE LONG WAVE LIMIT OF ITS RANGE V. Ya. Gol'nev, N. L. Kaydanovskiy, and V. G. Malumyan (Main Astronom. Obs., Acad. of Aci. USSR) p 413-418 5 refs (See N63-11552 04-05)
8. OBSERVATION OF THE SOLAR ECLIPSE OF 15 FEBRUARY 1961 ON WAVELENGTHS 3.2 AND 1.6 cm Su Shih-wen, Hsiao Kuang-chia, Wu Huai-wei, Tung-wu, Wu Chin-ch'i, V. S. Troitskiy, V. L. Rakhlin, K. M. Strezhneva, and M. R. Zelinskaya (Sci. Res. Radiophys. Inst., Gor'kiy U.) p 419-426 7 refs (See N63-11553 04-05)
9. ON THE ABSOLUTE MEASUREMENT OF THE INTENSITY OF RADIO EMISSION N. M. Tseytlin (Sci. Res. Radiophys. Inst., Gor'kiy U.) p 427-436 8 refs (See N63-11554 04-05)

N63-11546 Joint Publications Research Service, Washington, D.C.
USE OF AN ABSOLUTE RADIO ASTRONOMICAL METHOD FOR CALIBRATION OF SMALL ANTENNAS AT CENTIMETER WAVELENGHS
V. S. Troitskiy and N. M. Tseytlin Transl. from Izvest. Vyssh. Ucheb. Zabed., Radiofizika (Gor'kiy, USSR), v. 5, no. 4, 1962 p 623-628 *In its* News of Higher Educational Inst., Min. of Higher and Secondary Specialized Educ. USSR, Radiophys. Ser. Dec. 31, 1962 p 1-13 6 refs (See N63-11545 04-05) OTS: $23.50

A method is proposed for measuring the parameters of antennas at centimeter wavelengths, using standard radiation from a black disc with small angular dimensions. Results are presented of an

experimental verification of the method from wavelengths 1.6, 3.2, and 10 cm. The measurement levels in the decimeter wavelength band are discussed. Author

N63-11547 Joint Publications Research Service, Washington, D.C.
RESTORATION IN RADIO ASTRONOMY BY APPROXIMATE METHODS
A. Balklav Transl. from Izvest. Vyssh. Ucheb. Zaved., Radiofizika (Gor'kiy, USSR), v. 5, no. 4, 1962 p 629-639 *In its* News of Higher Educational Inst., Min. of Higher and Secondary Specialized Educ. USSR, Radiophys. Ser. Dec. 31, 1962 p 14-38 11 refs (See N63-11545 04-05) OTS: $23.50

Three approximate methods are considered for the elimination of the systematic error introduced by radio telescopes into the observation results. It is possible to use computers to solve the restoration problem. The principal diagram of a device which makes it possible to automatize, completely, the restoration process is given. Author

N63-11548 Joint Publications Research Service, Washington, D.C.
ON THE POSSIBILITY OF CONSTRUCTION OF A COORDINATE TRANSFORMER OF HIGHER ACCURACY FOR A TRACKING SYSTEM OF A RADIO TELESCOPE
G. G. Basistov Transl. from Izvest. Vyssh. Ucheb. Zaved., Radiofizika (Gor'kiy, USSR), v. 5, no. 4, 1962 p 640-643 Presented at the expanded plenary session of the Comm. on Radio Astronomy, Astronomy Council, Acad. of Sci. USSR, Moscow, 1960 *In its* News of Higher Educational Inst., Min. of Higher and Secondary Specialized Educ. USSR, Radiophys. Ser. Dec. 31, 1962 p 39-50 7 refs (See N63-11545 04-05) OTS: $23.50

A coordinate converter, using digital integrators, is considered for the tracking system of radio telescopes. The complexity of the computational scheme, and the influence of the portion of the computational scheme, included in the servomechanism, on the stability are estimated. Author

N63-11549 Joint Publications Research Service, Washington, D.C.
TRIPARTITE RADIO INTERFEROMETER
V. I. Babiy and A. G. Sukhovey Transl. from Izvest. Vyssh. Ucheb. Zaved., Radiofizika (Gor'kiy, USSR), v. 5, no. 4, 1962 p 799-801 *In its* News of Higher Educational Inst., Min. of Higher and Secondary Specialized Educ. USSR, Radiophys. Ser. Dec. 31, 1962 p 397-402 5 refs (See N63-11545 04-05) OTS: $23.50

A tripartite radio interferometer was used to determine the shape and magnitude of the scattering of the radiation source upon passage of the radio waves through the supercorona of the sun during the eclipse of the Crab nebula. The sensitivity of the tripartite radio interferometer amounts to 5×10^{-25} W.m^{-2}.cps^{-1}. J.R.C.

N63-11550 Joint Publications Research Service, Washington, D.C.
CHOICE OF TIME CONSTANT FOR A RADIO INTERFEROMETER
V. I. Babiy Transl. from Izvest. Vyssh. Ucheb. Zaved., Radiofizika (Gor'kiy, USSR), v. 5, no. 4, 1962 p 801-802 *In its* News of Higher Educational Inst., Min. of Higher and Secondary Specialized Educ. USSR, Radiophys. Ser. Dec. 31, 1962 p 403-405 (See N63-11545 04-05) OTS: $23.50

A study is made to ascertain the time constant for a radio interferometer. The interference method is used to choose the optimum time constant for which the random fluctuation error becomes minimal. For a simple RC network, which is usually employed for integration, the value of the signal at the output is

$$\tau_c \sim [1 + 4x^2 (\tau/t_x)^2]^{-1/2}$$

where τ is the time constant of the RC network. The fluctuation sensitivity and random fluctuation error are determined. J.R.C.

N63-11551 Joint Publications Research Service, Washington, D.C.
PRECISION MEASUREMENT OF RADIO EMISSION OF THE MOON ON $\lambda = 3.2$ cm
L. N. Bondar, M. R. Zelinskaya, V. A. Porfir'yev, and K. M. Strezhneva Transl. from Izvest. Vyssh. Ucheb. Zaved., Radiofizika (Gor'kiy, USSR), v. 5, no. 4, 1962 p 802-804 *In its* News of Higher Educational Inst., Min. of Higher and Secondary Specialized Educ. USSR, Radiophys. Ser. Dec. 31, 1962 p 406-412 2 refs (See N63-11545 04-05) OTS: $23.50

Precision measurements are made of radio emission of the moon on a wavelength of 3.2 cm, using the method of continuous standardization of the antenna. The measurement of the moon's temperature was made with two radio telescopes with a fluctuation threshold of 1° at a time constant of 1 sec. The DC component of the radio temperature of the moon was found to be 213° with the 1.5-meter mirror, and a component of 216° ±60 with the 4-meter mirror. J.R.C.

N63-11552 Joint Publications Research Service, Washington, D.C.
OBSERVATIONS WITH THE LARGE PULKOVO RADIO CELL SCOPE ON $\lambda = 33$ cm BEYOND THE LONG WAVE LIMIT OF ITS RANGE
V. Ya. Gol'nev, N. L. Kaydanovskiy, and V. G. Malumyan Transl. from Izvest. Vyssh. Ucheb. Zaved., Radiofizika (Gor'kiy, USSR), v. 5, no. 4, 1962 p 805-807 *In its* News of Higher Educational Inst., Min. of Higher and Secondary Specialized Educ. USSR, Radiophys. Ser. Dec. 31, 1962 p 413-418 5 refs (See N63-11545 04-05) OTS: $23.50

Observations are made with the large Pulkovo radio telescope on a wavelength of 33 cm beyond the long wave limit of its range. For the observations on 33-cm wavelength, the telescope was equipped with a direct amplification receiver using three cascaded traveling wave tubes with an overall gain of 70 db on the high frequency and a bandwidth of 60 Mcs. The observations carried out have made it possible to resolve the Saggitarius-A source and to show that the spectrum of the galactic core cannot be attributed to the thermal mechanism of radiation only. The radiation recordings for the sources NGC6523 and NGC6514 differ in declination by one 51'. Observation of the NGC06618 nebula on 33-cm wavelength has confirmed the earlier measurements on wavelengths of 3 cm and 10 cm, according to which the center of gravity of the emission is shifted relative to the visible core of the nebula. J.R.C.

N63-11553 Joint Publications Research Service, Washington, D. C.
OBSERVATION OF THE SOLAR ECLIPSE OF 15 FEBRUARY 1961 ON WAVELENGTHS 3.2 AND 1.6 cm
Su Shih-wen, Hsiao Kuang-chia, Wu Huai-wei, Tung-wu, Wu Chin-ch'i, V. S. Troitskiy, V. L. Rakhlin, K. M. Strezhneva, and M. R. Zelinskaya Transl. from Izvest. Vyssh. Ucheb. Zaved., Radiofizika (Gor'kiy, USSR), v. 5, no. 4, 1962 p 807-810 *In its* News of Higher Educational Inst., Min. of Higher and Secondary Specialized Educ. USSR, Radiophys. Ser. Dec. 31, 1962 p 419-426 7 refs (See N63-11545 04-05) OTS: $23.50

Observations are made of the solar eclipse of 15 February 1961 on wavelengths 3.2 and 1.6 cm, using modulation radiometers in the radio telescopes. The temperature and the effective dimensions of the sun at radio wavelengths varied during the course of the solar cycle. A particular sharp change occurred in the temperature of the sun. The radio diameter on 3.2 cm wavelength averaged over nine years was 1.049 with a minimum value of 1.038 in 1954. The contraction and expansion of the chromospheric layers and the lower corona layers responsible for the centimeter radiation occurring during the entire solar cycle are apparently much weaker than the development of the total activity of the sun. J.R.C.

N63-11554 Joint Publications Research Service, Washington, D. C.
ON THE ABSOLUTE MEASUREMENT OF THE INTENSITY OF COSMIC RADIO EMISSION

N. M. Tseytlin Transl. from Izvest. Vyssh. Ucheb. Zaved., Radiofizika (Gor'kiy, USSR), v. 5, no. 4, 1962 p 810-812 *In its* News of Higher Educational Inst., Min. of Higher and Secondary Specialized Educ. USSR, Radiophys. Ser. Dec. 31, 1962 p 427-436 8 refs (See N63-11545 04-05) OTS: $23.50

A method is presented for obtaining absolute measurement of the intensity of cosmic radio emission. The method makes it possible to standardize the magnitude of the intensity of cosmic radio emission from individual regions of space in the wavelength band 1 to 2.5 meters. Thus, it is possible to use these regions as references to measure the isophots of cosmic radio emission and to correct the existing radio isophots. The use of large antennas with an aperture diameter of 50 to 100 meters makes it possible to use the moon as a black disk, the average temperature of which in the meter band is approximately 220°K with a possible error on the order of 10%. Therefore, one can standardize regions with a radio emission temperature near 220°K which in conjunction with the measurements with small antennas will yield two reference regions of the sky. J.R.C.

N63-11557 Turku U. Astronomia-Optika Inst. (Finland)
ZONENBEOBACHTUNGEN MIT DEM GROSSEN ZENITROHR DER STERNWARTE TURKU-TUORLA [ZONE OBSERVATIONS WITH THE LARGE ZENITH TUBE OF THE TURKU-TUORLA OBSERVATORY]
Liisi Oterma 1962 17 p 4 refs In German
(*Its* Informo No. 24; Ann. Univ. Turku. Ser. A, Vol. 56)

The new zenith telescope is presently used for the study of polar variations. Because of the large opening and broad field, a large number of stars which culminate near the zenith may be observed. A test of zone observations is being carried out to determine the applicability of larger telescopes for improved star-position study. The zone widths are admittedly rather small, but it is possible, by mounting such telescopes at various zenith distances, to conduct pure zone observations. In this manner, slight changes in the zenith distance of the telescope are revealed by reference to known stars. A.S.

N63-11558 Turku U. Astronomia-Optika Inst. (Finland)
OBJECTIF STABILEMENT APLANÉTIQUE [AN APLANATICALLY STABILIZED OBJECTIVE]
Liisi Oterma 1962 19 p 5 refs In French
(*Its* Informo 25)

The possibility of constructing an achromatic objective with two lenses in such a manner that the eccentricity of the objective would have no important effect on the symmetry of the image is studied. Nonspherical surfaces would be required to suppress spherical aberration. Calculations for the construction and control of the aplanatically stabilized objective are presented and are compared with those for an ordinary aplanatic objective used in astronomy. Formulas are given for calculating Seidel terms and for calculating the path of the different rays. I.v.L.

N63-11920 New Mexico State U. Research Center, University Park
BLUE CLEARING DURING THE 1960-61 MARS APPARITION
Bradford A. Smith Repr. from Pub. Astron. Soc. Pacific, v. 73, no. 435, Dec. 1961 p 456-459 4 refs
(NASA Grant NsG-142)

During the 1960 to 1961 Mars apparition, the New Mexico State University Research Center conducted a photographic study of Mars in red, blue, and ultraviolet light. Blue clearing and an extensive network of fine and coarse lines on blue and ultraviolet plates were recorded. Blue plates of sufficiently good quality for determination of blue clearing were obtained. Opposition of Mars occurred on December 30, 1960, and a higher percentage of dates of blue clearing occurred following this date. This survey, at an effective wavelength of λ 4500, recorded many blue images with complete obscuration, but found none that showed complete visibility of surface markings. The survey does indicate that partial weak clearings are probably more common than is generally supposed. A.S.

06 AUXILIARY SYSTEMS

Includes: fuel cells and solar cells; gas turbines; hydraulic, pneumatic and electrical control systems and actuators; and inverters.

For primary propulsion systems see: PROPULSION

For related information see: 08 Communications; 09 Electronics; 10 Facilities; 15 Instrumentation; and 22 Navigation and Guidance.

N63-11677 Naval Research Lab., Washington, D.C.
DIRECT ENERGY CONVERSION: LITERATURE ABSTRACTS
Dec. 1962 124 p 735 refs
OTS: $3.50

This document consists of a collection of references from various sources covering the current literature on thermoelectricity, thermionic emission, photoelectric processes, magnetohydrodynamics, electrochemical processes, energy storage, and energy sources. Author

N63-11741 National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
USE OF A SEALED SILVER-CADMIUM BATTERY ON EXPLORER XII
T. J. Hennigan and A. O. Apelt Washington, NASA, Jan. 1963 9 p Previously processed as ARS Paper-2509-62; for abstract see N63-10258 01-06
(NASA TN D-1543) OTS: $0.50

Since silver-cadmium cells may be constructed entirely free of magnetic materials, a secondary silver-cadmium battery was used on Explorer XII satellite which was launched in 1961 to study radiation and magnetic fields. A program has been carried out at Goddard Space Flight Center to determine the feasibility of using the battery in this space application. The operation of the power system on Explorer XII is outlined, and cycling data, telemetered from the satellite, are presented. The first application of a silver-cadmium battery on a satellite was very satisfactory; in flight, no deterioration of the battery power supply was observed. Author

N63-11825 Atomics International, Canoga Park, Calif.
TEMPERATURE COEFFICIENTS AND SPECTRA IN THE HYDRIDE MODERATED SNAP REACTORS
J. Miller, R. L. Brehm, and W. J. Roberts Dec. 30, 1962 58 p 22 refs
(Contract AT(11-1)-GEN-8)
(NAA-SR-7140) OTS: $1.25

A summary of SNAP temperature-coefficient measurements accomplished on the SNAP Experiment and developmental Reactors is presented. Isothermal measurements, transient experiments, and power-coefficient measurements are included. Analysis of the experiments resulted in isolation of component effects. The thermal spectrum temperature coefficient for these zirconium hydride moderated systems is shown to be on the order of $-0.04¢/°$ F. A new model for the energy-transfer process in zirconium hydride is presented which reproduces measured spectra and results in temperature coefficients of the magnitude measured. The calculational model is phenomenologically based and uses Fermi-Dirac statistics to describe the state populations of the protons in the zirconium hydride. Author

07 CHEMISTRY

Includes: chemical analysis and identification (e.g., spectroscopy); chemical engineering; chemical properties of materials; and synthesis.

For related information see: 18 Materials, Metallic; 19 Materials, Non-metallic; and 26 Propellants and Combustion.

N63-11556 Massachusetts U. Polymer Research Inst., Amherst

THE CRYSTALLINITY OF POLYOLEFINS

Sadao Hoshino and Kiichiro Sasaguri Aug. 1, 1962 37 p 4 refs
(Contract Nonr-3357(01))
(ONR-TR-50)

The method proposed by P. H. Hermans was used to determine the crystallinity of high- and low-density polyethylene and polypropylene crystals, and the values obtained were found to be consistent with those obtained using X-ray and infrared absorption methods. Herman's method, which consists of comparing the quantities proportional to the crystalline and amorphous contents of the crystal and finding a linear relationship which can be applied to other samples, was found to be a convenient method of obtaining a measure of crystallinity. M.P.G.

N63-11559 Massachusetts U. Polymer Research Inst., Amherst

THE INTERNAL FIELD AND THE ADDITIVITY OF BOND POLARIZABILITIES

Richard S. Stein and Robert L. Rowell Nov. 29, 1962 48 p 13 refs
(Contract Nonr-3357(01))
(ONR-TR-40)

Measurements of the longitudinal and transverse principle bond polarizabilities of the (C-C) and (C-H) bonds of hydrocarbons were made and compared to the Γ_{CC} values reported by Denbigh and Bunn and Daubeny. The apparent difference between the Denbigh values and the Bunn and Daubeny values is resolved on the basis that the former were derived from measures of hydrocarbon vapors and the latter from n-paraffin crystals. The value of Γ_{CC} was found to depend on (1) the size of the vapor phase n-paraffin, (2) whether the molecule is in the vapor or solid phase, whether the solid phase is crystalline or amorphous, and (4) the crystal structure of the solid phase. These differences are considered to be a consequence of internal field effects. These field effects were computed for some simple cases, and negative anisotropies were found for both BD- and D-polarizabilities. M.P.G.

N63-11573 Rocket Power, Inc., Pasadena, Calif.

THERMODYNAMICS OF SEVERAL LIGHT METAL OXIDES, HALIDES AND OXYHALIDES Second Quarterly Report, 9 August through 9 November 1962

J. A. Blauer, M. A. Greenbaum, and M. Farber [1962] 19 p 11 refs
(Contract DA 04-495-ORD-3520; ARPA Order 40-62)
(QR-3530-2)

The reaction $B_2O_3 + BCl_3 = (BOCl)_3$ has been studied by the method of transpiration in the temperature range of 486°K to 775°K. The results have been interpreted in terms of the heat of formation and entropy of $(BOCl)_3$. The values obtained for $\Delta H_{f298°K}$ and $S_{298°K}$ are, respectively, $\Delta H_{f298°K} = -405.7 \pm 0.3$ kcal/mole and $S_{298°K} = 91.3 \pm 0.4$ cal/deg/mole. Author

N63-11580 Science Council of Japan, Tokyo

[PAPERS PRESENTED AT THE] INTERNATIONAL SYMPOSIUM ON MOLECULAR STRUCTURE AND SPECTROSCOPY, [TOKYO] SEPTEMBER 10-15, 1962

[1962] 1153 p refs In 4 vols.

This symposium was concerned with research on internal rotation; molecular vibrations and physicochemical problems; spectra of free radicals; results of chemical interest from microwave spectroscopy; theoretical aspects; techniques and applications of molecular structure and spectroscopy; and molecular interaction. I.v.L.

N63-11587 Air Force Cambridge Research Labs. Geophysics Research Directorate, Bedford, Mass.

INFRARED ABSORPTION BY CARBON DIOXIDE, WATER VAPOR, AND MINOR ATMOSPHERIC CONSTITUENTS

Darrell E. Burch, David Gryvnak, Edgar B. Singleton, Wilbur L. France, and Dudley Williams (Ohio, State U.) July 1962 325 p 53 refs A reissue of three reports formerly published separately but now available only in this compilation
(Contract AF 19(604)-2633)
(AFCRL-62-698; previously issued in parts as AFCRL-TN-60-674; AFCRL-255; AFCRL-412)

CONTENTS:

1. ABSORPTION BY NITROUS OXIDE, CARBON MONOXIDE AND METHANE D. E. Burch and D. Williams 157 p 24 refs (See N63-11588 04-07)
2. ABSORPTION BY CARBON DIOXIDE D. E. Burch, D. Gryvnak, and D. Williams 96 p 13 refs (See N63-11589 04-07)
3. ABSORPTION BY WATER VAPOR AND NITROUS OXIDE D. E. Burch, E. B. Singleton, W. L. France, and D. Williams 70 p 16 refs (See N63-11590 04-07)

N63-11588 Air Force Cambridge Research Labs. Geophysics Research Directorate, Bedford, Mass.

ABSORPTION BY NITROUS OXIDE, CARBON MONOXIDE AND METHANE

Darrell E. Burch and Dudley Williams *In its* Infrared Absorption by Carbon Dioxide, Water Vapor, and Minor Atmospheric Constituents July 1962 157 p 24 refs (See N63-11587 04-07)

The infrared absorption of the minor atmospheric gases, nitrous oxide, carbon monoxide, and methane, alone and in binary mixtures with nitrogen, has been investigated over wide ranges of absorber concentration w and total pressure P. Curves are presented showing the total absorption as a function of w and as a function of equivalent pressure P_e. These curves provide a basis for the prediction of the total absorption for any values of w and P_e included in this study. The strong-line approximation was evaluated and found to be roughly proportional to $\sqrt{w}$ but not to $\sqrt{P_e}$, perhaps because of the effect of weak lines adjacent to strong ones. Values for the band intensity of the various bands studied were obtained from the study of the total absorption at small values of w and sufficiently large values of P_e. M.P.G.

N63-11589 Air Force Cambridge Research Labs. Geophysics Research Directorate, Bedford, Mass.

ABSORPTION BY CARBON DIOXIDE

Darrell E. Burch, David Gryvnak, and Dudley Williams *In its* Infrared Absorption by Carbon Dioxide, Water Vapor, and Minor Atmospheric Constituents. July 1962 96 p 13 refs (See N63-11587 04-07)

The infrared absorption of samples of carbon dioxide, alone and in binary mixtures with nitrogen, has been investigated over wide ranges of absorber concentration w and total pressure P. Curves are presented which show the total absorption of CO_2 bands at 3716, 3609, 2350, 1064, and 961 cm^{-1} for various values of w as a function of the equivalent pressure P_e, and for various values

of P_e as a function of w. These curves provide a basis for the prediction of the total absorption or the fractional absorption for any values of w and P_e included in this study. The effects of temperature on the absorption were studied for the 1064 and 961 cm^{-1} bands from ambient temperature to 70° C; results showed that, in this temperature range, the increase in total absorption can be predicted by using an elementary function which is based on the calculated increase in population in the lower energy level giving rise to the absorption. M.P.G.

N63-11590 Air Force Cambridge Research Labs. Geophysics Research Directorate, Bedford, Mass.

ABSORPTION BY WATER VAPOR AND NITROUS OXIDE

Darrell E. Burch, Edgar B. Singleton, Wilbur L. France, and Dudley Williams *In its* Infrared Absorption by Carbon Dioxide, Water Vapor, and Minor Atmospheric Constituents. July 1962 70 p 16 refs (See N63-11587 04-07)

The self-broadening coefficient has been experimentally determined for several bands of N_2O, CO, CH_4, CO_2 and H_2O; this coefficient indicates the relative broadening ability of the absorbing gas with respect to N_2. Using these self-broadening coefficients, an equivalent pressure P_e was defined as a single variable including both the broadening of the absorbing gas and of N_2. Absorption curves were obtained from which the total absorption for the N_2O bands at 2563, 2461, 1285, 1167, 692, and 589 cm^{-1} was determined as function of absorber concentration w and equivalent pressure P_e. Similar total absorption measurements were made for the H_2O bands at 5332, 3700, and 1595 cm^{-1}. A comparison of these results with those obtained earlier shows good agreement. M.P.G.

N63-11651 Gt. Brit. Ministry of Aviation. Technical Information and Library Services, Mottingham

PREPARATION AND PROPERTIES OF VARIOUS GLYCOL NITRATES (PREPARATIONS ET PROPRIETES DE DIVERS NITRATES DE GLYCOLS)

M. P. Aubertein Oct. 1962 33 p 5 refs Transl. from Mem. Poudres (Paris), 30, 1948 p 7-42
(TIL/T-5339)

This report comprises a method used for studying nitration, generally, and that of glycols in particular; the nitration reaction; detailed study of glycol nitration; best practical conditions for manufacturing nitrates; and the properties of glycerine, glycol, diethylene glycol, triethylene glycol, and butane diols 1.3, 1.4, and 2.3. Results are given diagrammatically for solubility in various media. The action of sulphonitric acid on glycol nitrates is studied and discussed. Author

N63-11656 Naval Research Lab., Washington, D.C.

THE ADHESION OF ICE TO LUBRICATED SURFACES

H. R. Baker, W. D. Bascom, and C. R. Singleterry *In its* Report of NRL Progress Dec. 1962 p 1-6 10 refs (See N63-11655 04-01)
OTS: $1.25

The adhesion of ice to lubricated steel has been shown to vary over a wide range, depending upon the polar organic additive present in the lubricating oil. The adhesion is least for systems showing contact angles of 170 degrees, or larger, through water drops on steel submerged in the oil solutions. The extremely low adhesions sometimes observed in such systems arise because water does not readily displace the final thin film of bulk oil from the metal surface to establish true water/solid contact. High water-contact angles are associated with strong adsorption of the polar additive at the oil/metal interface and with relatively low adsorption in the oil/water interface. Author

N63-11690 United Technology Corp. Research and Advanced Technology Div., Sunnyvale, Calif.

THERMOCHEMISTRY OF OXYGEN-FLUORINE BONDING Seventh Quarterly Technical Summary Report, 1 September through 30 November 1962

J. D. Breazeale Jan. 7, 1963 22 p 6 refs
(Contract Nonr 3433(00); ARPA Order 184-62)
(UTC-2002-QT7)

Progress to date is as follows: (1) The preliminary value obtained for the heat of formation of fluorine perchlorate from the heat evolved during fluorination of 70 percent perchloric acid has been refined to yield the value of +18.5Kcal/mole. However, considerable uncertainty is still associated with this value as a result of experimental variations. From preliminary calorimetric studies of the gas phase reaction of fluorine perchlorate with hydrogen, the determination of the heat of combustion appears to be an attractive alternative for the evaluation of the heat of formation of fluorine perchlorate. (2) Mass spectrographic analysis of trifluoromethyl hypofluorite has shown that a purity of greater than 97 percent has been achieved for this material and has established that the technique employed for the removal of COF_2, the primary byproduct, is particularly effective. (3) Fluorine nitrate has been found to be reactive with hydrogen, and explosive mixtures have been obtained. The material also hydrolyzes readily in caustic solution under conditions achieved in the modified two-chamber gas combustion bomb. Author

N63-11703 National Research Corp., Cambridge, Mass.

THERMODYNAMIC PROPERTIES OF BI-METALLIC COMPOUNDS Quarterly Technical Report, Oct. 1, 1962-Dec. 31, 1962

Ludwig G. Fasolino Jan. 7, 1963 18 p 25 refs
(Contract Nonr-3608(00); ARPA Order 23-61)

Solubility tests were run for boron, aluminum diboride, and aluminum dodecaboride to determine if a suitable solvent could be found which would allow solution calorimetric methods to be employed in determining the heats of formation of these binary compounds. Boron powder dissolved satisfactorily in an acidic potassium periodate solution at 30° C. This solvent was without apparent effect on either AlB_2 or AlB_{12}. Thirty solvent systems were included in this study, none of which proved feasible as a solvent for the borides, even at elevated temperatures. It is concluded that the heats of formation of aluminum diboride and aluminum dodecaboride must be determined by methods other than acid solution calorimetry. Author

N63-11711 Raytheon Co. Research Div., Waltham, Mass.

INVESTIGATION OF EFFECTS OF ION-INDUCED DEFECTS ON SURFACE REACTIONS: THE ADSORPTION OF OXYGEN ON GALLIUM ANTIMONIDE Scientific Report No. 3

D. Shooter Oct. 19, 1962 21 p 21 refs
(Contract AF 19(604)-8004)
(S-480; AFCRL-62-924)

Oxygen adsorption has been measured on the (111) and $(\bar{1}\bar{1}\bar{1})$ faces of GaSb. A quartz microbalance, enclosed in an ultrahigh vacuum system, was used to measure the oxygen uptake. Weight changes of 4×10^{-8} grams, about five percent of the total adsorption, could be detected. Prior to each experimental run the crystal surface was made atomically clean by ion bombardment. At oxygen pressures between 10^{-7} and 10^{-6} torr, adsorption proceeded readily with the rate gradually decreasing to zero. A difference in both the rate of adsorption, $(111) > (\bar{1}\bar{1}\bar{1})$ and the extent of adsorption $(\bar{1}\bar{1}\bar{1}) > (111)$ was observed. It was calculated that the (111) face adsorbed 3/4 molecule and the $(\bar{1}\bar{1}\bar{1})$ face adsorbed 5/4 molecules, per surface atom. Author

N63-11717 Aberdeen Proving Ground. Coating and Chemical Lab., Md.

DETERMINATION OF PHTHALIC ANHYDRIDE IN ALKYD RESINS BY TRANSESTERIFICATION AND GAS CHROMATOGRAPHIC SEPARATION

George G. Esposito Nov. 20, 1962 9 p 1 ref
(CCL-132)

A gas-liquid chromatographic method which is not affected by the presence of other dibasic acids was developed for the determination of phthalic anhydride in coating resins. A qualitative chromatographic method developed in this laboratory was modified to produce quantitative results. The resin is subjected to transesterification with lithium methoxide, and phthalic anhydride is determined as dimethyl phthalate, using an internal standard. Author

N63-11718 Aberdeen Proving Ground. Coating and Chemical Lab., Md.

FURTHER STUDIES OF DETERGENCY

A. Mankowich Nov. 19, 1962 18 p 7 refs
(CCL-133)

Further study of the proposed detergency (D) - micellar solubilization (S) function, $D = K_1 S + K_2$, centered around the connection of the constants K_1 and K_2 to physicochemical factors of soil and surfactant, has resulted in establishing K_1 and K_2 relationships for 4-point (4 surfactants - 1 soil, and 4 soils - 1 surfactant) and 5-point (5 surfactants - 1 soil) systems. The constants appear to be related to physical, and not random, parameters. Trends in the derived K_1 and K_2 relationships are (a) K_2 values of both multisurfactant and multisoil systems are functions of Antonow's interfacial tension, (b) K_1 values of multisurfactant systems are connected to surfactant HLB, while K_1 values of multisoil systems are connected to soil dipole moment, and (c) prevalence of trigonometric functions, especially in 5-point systems. Author

N63-11736 Hynes Chemical Research Corp., Durham, N.C.

FUNDAMENTAL RESEARCH ON THE DIRECT FLUORINATION OF ORGANIC COMPOUNDS. SECTION A Quarterly Technical Report No. 1, September 1, 1962-November 30, 1962

Lucius A. Bigelow, John B. Hynes, Abe F. Maxwell, and Brian C. Bishop [1962] 15 p 7 refs
(ARPA Order 40-62, Amend. 21)

The mild, direct fluorination of chlorodifluoroacetonitrile has been studied and shown to yield two interesting new compounds, $ClF_2CF_2NF_2$ and $ClF_2CF{=}NF$. The formation of the latter suggested that other halogenated nitriles could also be partially fluorinated under carefully controlled conditions. Accordingly, the fluorination of trifluoroacetonitrile has been reexamined and found to yield $CF_3CF{=}NF$ in fairly substantial quantity for this type of reaction. An alternate route to unsaturated, highly fluorinated carbon-nitrogen systems, namely the pyrolytic defluorination of perfluorinated compounds, has also been studied. Perfluoropiperidine yielded nonafluoro-1-piperidine in 50% to 60% yield. The pyrolyses of CF_3NF_2, $C_2F_5NF_2$, $C_4F_9NF_2$, $CF_3NFC_2F_7$ and $(CF_2NF)_3$ have also been examined, the first of which provided a new method for preparing perfluoromethyleneimine, $CF_2{=}NF$. Author

N63-11738 Linde Co. Speedway Labs., Indianapolis, Ind.

MEASUREMENT OF ARGON TRANSITION PROBABILITIES USING THE THERMAL ARC PLASMA AS A RADIATION SOURCE

N. N. Olsen [1962] 31 p 17 refs Submitted for Publication

The high-current arc plasma has been used as a source of radiation of known temperature and density to measure absolute transition probabilities of about 16 lines of each of the ArI and ArII spectra. The thermal plasma composition was computed, taking into consideration a cutoff of the atom partition function and lowering of the ionization potentials based on the theory of Debye-Hückel polarization. Author

N63-11764 European Atomic Energy Community, Brussels (Belgium)

FORTSCHRITTE BEI DER ANALYSE VON POLYPHENYLGEMISCHEN [PROGRESS IN THE ANALYSIS OF POLYPHENYL MIXTURES]

F. Geiss and M. J. Normand Joint Nuclear Research Center, Ispra Establishment (Italy), Chemistry Dept., [Oct.] 1962 19 p In German; English summary Presented at the Seventh Nuclear Congress, organized by the Comitato Nazionale Energia Nucleare, in Rome, June 15, 1962
(ORGEL Program)
(EUR-90.d) Available from Belgian American Bank and Trust Co., N.Y., account No. 121.86: 30 Belg. Fr.

The direct determination of the concentration of the so-called "high-boilers" by blackflushing in a gas chromatograph is described and compared with other competing methods as microdistillation and G.C. involving internal standard. An improved gas chromatographic separation of quater- and quinhquaphenyls by modified stationary phases (silicone grease + bentonite, CsCl) is demonstrated. Finally, the analysis of polyphenylic mixtures by thin layer chromatography on alumina and silicagel layer with $Ce(SO_4)_2/HNO_3$ as a colorizing spray reagent is shown. This method permits a rapid survey on global composition as well as a separation of the light polyphenyls of up to 20 mixtures on one plate only. Author

N63-11771 Atlantic Research Corp., Alexandria, Va.

GAS-METAL REACTION IN ROCKET NOZZLES Quarterly Progress Report, Sept. 1 to Dec. 1, 1962

J. D. Batchelor and E. L. Olcott Dec. 1962 35 p
(Contract AF 33(616)-7744)

Experimental study was continued to determine the nature and extent of chemical interactions between refractory metal alloys and the combustion products of several solid propellants. The propellant systems were selected to provide combustion products over a range of chemical compositions and temperatures. Several refractory alloys, both tungsten and tantalum base, were used. The filament test and propellant strand test procedures developed in this program were continued. Bar exposure tests in rocket motor exhausts were also used to provide further data. Examination of several nozzle inserts available from solid propellant motor firings made on another program were examined metallographically for evidence of chemical interactions. Author

N63-11782 Illinois U., Urbana

EFFECTS OF ADSORBED FILMS OF CAMPHOR AND THYMOL ON KINETICS OF THE TITANIUM (IV)-TITANIUM (III) ELECTRODE REACTION. A. THE VOLTAGE STEP METHOD. B. THE IMPEDANCE METHOD [Final Technical Report]

H. A. Laitinen, K. Eda, and M. Nakanishi Wright-Patterson AFB, Ohio, Aeronautical Research Labs., Sept. 1962 34 p 13 refs
(Contract AF 33(616)-5446)
(ARL-62-439)

The adsorption of camphor and thymol on a dropping mercury electrode was determined from capacitance measurements. A comparison was made of the electrode coverage as calculated from differential and integral double-layer capacity, and the magnitude of error caused by using differential capacity calculations was estimated. Author

N63-11801 Aberdeen Proving Ground. Coating and Chemical Lab., Md.

A STUDY ON THE CORROSION PROTECTION OF MAGNESIUM

Donald K. Stelling and William H. Deaver Dec. 6, 1962 28 p 46 refs
(CCL-134)

A brief discussion of the corrosion process of magnesium and a short description of most of the available chemical conversion and electrochemical treatments is presented. The effectiveness of many of the treatments is evaluated. Author

N63-11815 Argonne National Lab., Ill.
PROCEEDINGS OF THE SEVENTH ANNUAL MEETING ON BIOASSAY AND ANALYTICAL CHEMISTRY HELD OCTOBER 12 AND 13, 1961 AT ARGONNE NATIONAL LABORATORY
[1961] 96 p 39 refs
(Contract W-31-109-eng-38)
(ANL-6637)

CONTENTS:

1. INFLUENCE OF PHYSICAL STATE ON THE REMOVAL OF HYDROLYZABLE RADIOELEMENTS BY CHELATION J. F. Fried p 5-8 3 refs
2. LONG-TERM EFFECTS OF THERAPEUTIC REMOVAL OF INTERNALLY DEPOSITED PLUTONIUM Marcia W. Rosenthal p 9-11 4 refs
3. THE ESTIMATION OF A BODY BURDEN OF Pu FROM URINALYSIS DATA Walter S. Snyder (Oak Ridge Natl. Lab.) p 13-21 6 refs
4. THE DETERMINATION OF GROSS BETA AND GROSS ALPHA ACTIVITY IN URINE B. D. Gunter and T. B. Smiley, Jr. (General Dynamics) p 23-28
5. THE DETERMINATION OF β-EMITTING RADIONUCLIDES IN AQUEOUS FORMADIDE SOLUTIONS A. Schwebel (Natl. Bur. of Standards) p 29-31 2 refs
6. INITIAL TWO-YEAR EXPERIENCE WITH THE SAVANNAH RIVER PLANT PLUTONIUM URINALYSIS PROCEDURE W. R. Jacobsen (Du Pont de Nemours (E. I.)) p 33-42 3 refs
7. CRITICALITY AND CRITICALITY CONTROL J. E. Mc Laughlin, Jr. (AEC) p 43-57 7 refs
8. DETERMINATION OF ENVIRONMENTAL LEVELS OF RADIUM N. Irving Sax, Mary Beigel, and James C. Daly, and J. J. Gabay (N. Y. State Dept. of Health) p 59-84 6 refs
9. RADIUM-226 IN THE DIET IN THREE U.S. CITIES Naomi A. Holiden, Isabel M. Fisenne, and John H. Harley (AEC) p 85-95 8 refs
10. COMPARISON OF TWO METHODS FOR DETERMINING RADIUM-226 IN SOIL SAMPLES James Lamb (AEC) p 97-99

N63-11826 Atomics International, Canoga Park, Calif.
OXIDATION OF URANIUM CARBIDE BY CARBON DIOXIDE
E. W. Murbach and W. D. Turner Dec. 30, 1962 20 p 6 refs
(Contract AT(11-1)-GEN-8)
(NAA-SR-7482) OTS: $0.50

The oxidation of uranium carbide by carbon dioxide has been investigated as a possible first step in a low-decontamination cycle. "Reactive" uranium carbide begins to react with CO_2 at about 350° C. Between 375° and 500° C, the activation energy for the reaction was determined to be 25 kcal. At about 525° C, ignition occurs. Below about 670° C, the reaction is:

$$UC + 2CO_2 \rightarrow UO_2 + 2CO + C$$

Above about 670° C, free carbon is also removed; however, only 30% of the carbon is oxidized at the completion of the UC oxidation. Between 375° and 500° C, the oxidation reaction can be formally represented by a first order rate equation. At 450° C, the reaction is approximately proportional to the 0.7 power of the CO_2 pressure from 10 mm to 600 mm. Freshly arc-melted uranium carbide does not react appreciably with CO_2 at temperatures up to 600° C. However, exposure to air, saturated with water at room temperature, converts UC to the reactive state. The oxidized product, of which over 95% is 400 mesh, should be suitable for carbothermic reduction without further size reduction. Author

N63-11827 Atomics International, Canoga Park, Calif.
REPROCESSING STUDIES ON IRRADIATED URANIUM CARBIDE REACTOR FUEL
J. E. Bodine, J. Guon, R. J. Sullivan, and F. W. Gandolfo Dec. 30, 1962 19 p 12 refs
(Contract AT(11-1)-GEN-8)
(NAA-SR-7511) OTS: $0.50

One-hundred-gram quantities of uranium carbide, irradiated to burnups as great as 15,000 Mwd/MTU, have been converted to oxide in a controlled manner by reaction with air at temperatures up to 600° C. The oxide was reduced in hydrogen to form uranium dioxide. After one oxidation-reduction cycle, 83.6% of the oxide passed through a 200-mesh screen. In a decladding simulation experiment, the carbide fragmented to pieces ⅛ in. in diameter or less, with no appreciable oxidation occurring. One oxidation-reduction cycle then produced an oxide with 92.7% passing a 200-mesh screen. Fission product and plutonium decontamination factors for processed material were less than 2½. Author

N63-11831 Rocketdyne, Canoga Park, Calif.
RESEARCH IN FLUORINE CHEMISTRY Progress Report for Period 16 September 1962 to 15 December 1962
H. H. Rogers, J. H. Johnson, and S. Evans Jan. 8, 1963 34 p 10 refs
(Contract Nonr 1818(00))
(R-334-20)

Data from the electrolysis of the HF–N_2O_4, HF–NO, HF–N_2O_4–NO, HF–N_2O and the HF–FNO systems are correlated. It is concluded that the presence of H_2O in most systems, either as an initial component or as an electrolysis product, causes the same electrolysis products to form. New data on electrolyses in the HF–N_2O, HF–FNO, and HF–NH_3 systems are presented. It is suggested that the probable solubility of resulting F–N–O compounds in HF is accompanied by further electrolytic oxidation, thereby preventing their synthesis by electrolysis in HF. A new procedure for the electrolytic drying of HF, based on current reversal, has been developed and is described. The results are compared with the old method. The process of nickel dissolution at the anode during electrolysis is discussed, and a hypothesis explaining observed phenomena is presented. Author

N63-11843 Joint Publications Research Service, Washington, D.C.
METHODS OF CALCULATION IN MOLECULAR SPECTROSCOPY
L. A. Gribov (Acad. of Sci. USSR) Jan. 17, 1963 9 p 4 refs
Transl. from Izvest. Akad. Nauk. SSR (Moscow), v. 26, no. 10, Oct. 1962 p 1226-1230
(JPRS-17176) OTS: $1.10

Methods of computation, based on molecular spectroscopy, for various molecular and atomic parameters are reviewed. The review covers: (1) determination of the number of basic vibrations which appear in infrared and combined spectra on the basis of the assumed symmetry of the molecule; (2) calculation of all the frequencies of vibration; (3) finding the amplitude of displacement of atoms from equilibrium at the vibrational or amplitude change in equilibrium geometric parameters of molecules by solution of the equations for vibrations; (4) determination of the force coefficients or constant potential of a molecule by calculating frequencies and vibrational forms consistent with whole classes of bonding; (5) calculation of frequencies derivable from frequencies and forms of vibration by any parameters of the molecule; (6) derivation of information from vibrational spectra such as on particular formations of the electronic cloud of a molecule. A.S.

N63-11850 Geophysics Corp. of America, Bedford, Mass.
RESEARCH DIRECTED TOWARD STUDIES ON CHEMICAL RELEASE APPLICATIONS Final Report [Sept. 1, 1961-Aug. 31, 1962]

Jerome Pressman Dec. 1962 221 p refs
(Contract AF 19(628)-231; ARPA Order 258-61; Proj. Defender)
(GCA-TR-62-25-A; AFCRL-62-1086)

The complex phenomena associated with daylight and nighttime missile trails were examined experimentally and theoretically. The laboratory program investigated the chemiluminescent reaction associated with nighttime missile trails to determine the emitted radiation and the mechanism of the reaction. The theoretical program included a heuristic examination of rocket trail expansion mechanisms, dimensional analyses of these expansions, and a background study of nonequilibrium processes in order to find suitable models to describe the interaction of hydrodynamical flow, diffusion, and nonequilibrium relaxation. A continuum two-fluid model was formulated which treats the hydrodynamic and diffusive flow of ambient and exhaust gases (including expressions for momentum and energy transfer) simultaneously, in terms of a set of nonlinear partial differential equations. An appropriate computer program for solving these equations is presented. M.P.G.

N63-11855 Bureau of Mines, Washington, D.C.
METHODS FOR ANALYZING TUNGSTEN ORES AND CONCENTRATES
H[eber] E. Peterson, W. L. Anderson, and M. R. Howcroft 1963 34 p 18 refs
(BM-RI-6148)

This report revises an earlier publication by the Bureau of Mines on tungsten analytical procedures and expands the coverage by including appropriate procedures for the critical impurity elements that commonly occur in tungsten ores and concentrates. The basic methods described are not original, but many of the modifications to improve reliability and sensitivity were developed by the Bureau. The colorimetric and gravimetric determination of tungsten and molybdenum in ores and low-grade products is taken up first. Next, the analysis of concentrates is described. In this way, a contrast is made between the methods applied to an ore and to a concentrate. The methods for determining impurities in tungsten concentrates then are discussed. Author

08 COMMUNICATIONS

Includes: communications equipment and techniques; noise; radio and communications blackout; telemetry; tracking; and wave propagation.

For tracking stations see: 10 Facilities.

For related information see: 06 Auxiliary Systems; 09 Electronics; 15 Instrumentation; and 22 Navigation and Guidance.

N63-11564 Radio Corp. of America. Missile and Surface Radar Div., Morrestown, N.J.
DOWN-RANGE ANTI-MISSILE MEASUREMENT PROGRAM (DAMP). ASYMPTOTIC SOLUTION OF MAXWELL'S EQUATIONS IN INHOMOGENEOUS ISOTROPIC MEDIA
R. M. Lewis and J. B. Keller (New York U.) June 1962 37 p 18 refs
(Contract DA-36-034-ORD-3144RD; ARPA Order 51; Proj. Defender)
(DAMP-TM-62-13)

The analytical results described in this report are part of a continuing program directed toward better understanding of the effects of plasma and wake on radar electromagnetic propagation. Author

N63-11585 Oklahoma State U. Research Foundation, Stillwater
DEVELOPMENT OF TRANSISTORIZED MINIATURE 15-CHANNEL PULSE-TIME TELEMETRY MODULATOR AND FIELD SERVICE ACTIVITY, VOLUME I Final Report
Oscar L. Cooper Oct. 1, 1962 27 p
(NASA Contract NASr-4)
OTS: $2.60, $1.01 mf

Circuit investigation and development for a 15-channel pulse-position telemetry modulator unit has been completed. This circuit, which is compatible to the AN/DKT-7 unit, its predecessor, will accomodate 15 sources of analog information appearing as d.c. voltages between the limits of zero and five volts d.c. Each channel is allocated a 200-microsecond period of a 3200-microsecond frame, and has a total excursion of 150 microseconds, leaving a 50-microsecond guard band between channels. The output of the unit may be used as a trigger for a power modulator and radiofrequency pulse amplifier to complete the airborne telemetry system. Author

N63-11586 Oklahoma State U. Research Foundation, Stillwater
DEVELOPMENT OF TRANSISTORIZED MINIATURE 15-CHANNEL PULSE-TIME TELEMETRY MODULATOR AND FIELD SERVICE ACTIVITY, VOLUME II, APPENDIX. A MINIATURIZED FIFTEEN-CHANNEL TELEMETRY MODULATOR Final Report
Oscar L. Cooper Oct. 1, 1962 52 p
(NASA Contract NASr-4)
OTS: $5.60, $1.76 mf.

Circuit investigation and development for a 15-channel pulse-position telemetry modulator unit has been completed. This circuit, which is compatible to the AN/DKT-7 unit, its predecessor, will accommodate 15 sources of analog information appearing as d.c. voltages between the limits of zero and five volts d.c. Each channel is allocated a 200-microsecond period of a 3200-microsecond frame, and has a total excursion of 150 microseconds, leaving a 50-microsecond guard band between channels. The output of the unit may be used as a trigger for a power modulator and radiofrequency pulse amplifier to complete the airborne telemetry system. Author

N63-11662 Congress. House. Committee on Science and Astronautics
1963 NASA AUTHORIZATION Hearings before the Subcommittee on Applications and Tracking and Data Acquisition of the Committee on Science and Astronautics, U. S. House of Representatives, Mar. 5, 6, 8, 12, 14 and Apr. 10, 1962
Washington, GPO, 1962 305 p
(87th Cong. 2nd Sess. Committee Print)
GPO: $1.00

The hearings of this subcommittee were concerned with the meteorological satellite program, communications satellites system, and tracking and data acquisition. I.v.L.

N63-11694 Royal Technical U. of Denmark. Ionosphere Lab., Copenhagen
OBSERVATIONS OF VLF RADIO NOISE AT GODHAVN, GREENLAND Technical (Final) Report
Eigil Ungstrup (Ph. D. Thesis) Sept. 1962 116 p 11 refs
(Contract AF 61(052)-298)
(*Its* Rept. 12; AFCRL-62-1140)

Audiofrequency radio noise in the band from 0.5 to 15 kc/s has been recorded at Godhavn, Greenland (geographically 69° 15.5 feet N, 53°30 feet W, geomagnetically 79.9°N, 32.6°E) since July 19, 1957. The data taken from the start of the recordings and to the end of 1961 have been treated, and the occurrence of whistlers and the type of ionospheric noise named chorus has been studied. All the whistlers observed at Godhavn seem to be short whistlers. The chorus at Godhavn occurs in the frequency range 500 to 1500 c/s and shows a negative correlation with magnetic activity. Other stations inside the auroral zones also observe chorus in this frequency range. Author

N63-11702 New York U. Coll. of Engineering, N.Y.
MULTISIGNAL CODING FOR SPACE TELEMETRY
Ludwik Kurz May 11, 1962 14 p 2 refs
(NASA Contract NAS5-408)
(Tech. Memo. 26) OTS: $1.60 ph, $0.80 mf

This memorandum introduces the idea of multisignal coding in which each code word is constructed from appropriate sums of basic signal waveforms. Thus there is a set of signal waveforms ϕ_1 (t), ϕ_2 (t), ... ϕ_n(t), each of which is of duration T, and the code words can be represented as sums of the form $a_1\ \phi_1(t) + a_2\ \phi_2(t) + \ldots + a_n\ \phi_n(t)$. The sequence of coefficients $a_1 a_2 \ldots a_n$ designates the code word. Author

N63-11750 Army Missile Command. Physical Sciences Lab., Redstone Arsenal, Ala.
TRANSMISSION OF INFORMATION THROUGH AN ARTIFICIALLY IONIZED ATMOSPHERE
R. A. Shatas Dec. 12, 1962 15 p 7 refs
(AMC-RR-TR-62-10)

If tolerated interruption in the communications link should not exceed a fraction of a second after the ionizing event, coherent narrow band light receivers and transmitters in the wavelength region between 1 and 100 microns are recommended. These conclusions were based on the computation of the critical frequency of a hot terrestrial atmosphere. To describe the absorption of electromagnetic radiation in the wavelength region of interest, resonant and nonresonant microwave absorption theories have been extended to higher frequencies. Communications links which can tolerate substantial interruptions after ionizing event can operate in the microwave wavelength region. The duration of the interruption is determined by the kinetics of atmospheric plasmas. The rate equations for such plasmas were derived and some of the coefficients determining the decay were computed on a quantum mechanical basis. Author

N63-11810 Engelhard Industries, Inc. Industrial Equipment Div., East Newark, N.J.
PRELIMINARY INVESTIGATION FOR WIRELESS CONTROL SYSTEM FOR AIRPORT LIGHTING Final Report
July 12, 1962 51 p
(Contract ARDS-494)

Investigations were conducted in order to determine the parameters affecting the transmission of underground signals for the purpose of wireless communication. It has been determined that with low-power, low-frequency transmission over a short antenna, a practical transmission distance is one mile. With moderate increases in the power and antenna length, transmission up to 3 miles is practical. Author

N63-11891 Queensland U., Brisbane (Australia)
OBSERVATIONS OF TRANS-EQUATORIAL PROPAGATION FROM BRISBANE Scientific Report No. 6
J. A. Thomas Mar. 1962 30 p 4 refs
(Contract AF 64(500)-9)
(AFCRL-62-343)

Observations of transequatorial back-scatter propagation have been analyzed with particular reference to anomalous propagation. Seasonal, diurnal, and directional variations are extracted and compared with the behavior of signals propagated via normal modes. Signal strength, fading, and phase path measurements have been made at 16 mc/s, and preliminary experiments carried out at 55 mc/s and over the range 15 to 30 mc/s using a back-scatter ionosonde. Author

N63-11892 Queensland U., Brisbane (Australia)
CROSS- AND AUTO-CORRELATION EFFECTS ASSOCIATED WITH ANOMALOUS TRANSEQUATORIAL PROPAGATION AT 16 Mc/s. Scientific Report No. 7
J. A. Thomas Mar. 1962 23 p 3 refs
(Contract AF 64(500)-9)
(AFCRL-62-344)

Correlation analyses of certain aspects of anomalous transequatorial back-scatter echoes have been caried out. These features are the "starting time," "duration," and "strength" of the echo. No significant correlation exists between any of the above features and solar or magnetic disturbance effects. Echoes which commence early in the afternoon tend to be stronger and to last longer than those which commence later. Days in which the echoes have similar duration, or starting time, or strength tend to be grouped together. Author

N63-11894 Queensland U., Brisbane (Australia)
LUNAR CONTROL OF ABNORMAL TRANSEQUATORIAL PROPAGATION Scientific Report No. 9
J. A. Thomas Mar. 1962 10 p 13 refs
(Contract AF 64(500)-9)
(AFCRL-62-346)

Lunar-tidal analyses of the "starting time," "intensity," and "duration" of anomalous transequatorial back-scatter echoes have been carried out. Semidiurnal lunar variations in "starting time" and "duration" are found, and an hypothesis is put forward to explain the observed phase of these variations. Author

N63-11895 Queensland U., Brisbane (Australia)
TRANSEQUATORIAL PROPAGATION ANALYSIS: RAY TRACING AND MODE ANALYSIS Scientific Report No. 10
J. A. Thomas and B. A. Mc Innes Mar. 1962 51 p 21 refs
(Contract AF 64(500)-9)
(AFCRL-62-347)

Two methods of ray-tracing are used for the analysis of transequatorial propagation. A graphical method proved rather too inaccurate and was replaced by a computational method, suitably modified to take account of tilted ionospheric regions. It is found that paths involving low ray elevation angles are more likely to provide the long-range anomalous echoes detected, and the chief mechanism is that of reflection from ionospheric tilts particularly prevalent in equatorial regions during the early evening hours. Mixed-mode propagation of back-scattered signals must be fully considered in any attempt to account for the intensity of echoes received. "Horizon-focusing" effects must be taken account of in deriving the field strength of radio signals at great distances. Author

N63-11896 Queensland U., Brisbane (Australia)
EXOSPHERIC PROPAGATION EXPERIMENTS Scientific Report No. 11
J. A. Thomas, B. A. Mc Innes, and J. Crouchley Mar. 1962 13 p 17 refs
(Contract AF 64(500)-9)
(AFCRL-62-348)

Experiments were carried out at 16 and 55 mc/s to search for possible exospheric propagation of back-scatter signals. A negative result was obtained over 6 weeks of continuous recording. The parameters of the system are examined, and it is shown that, if Gallet and Utlaut did in fact observe this type of propagation, then it should also have been observed at Brisbane. Author

N63-11900 Queensland U., Brisbane (Australia)
FINAL REPORT ON OBSERVATIONS OF FIELD-ALIGNED IRREGULARITIES AND TRANSEQUATORIAL PROPAGATION Scientific Report No. 16
J. A. Thomas, E. W. Dearden, E. M. Matthew, R. W. E. Mc Nicol, B. A. Mc Innes, D. G. Singleton, G. L. Goodwin, G. J. E. Lynch, and J. Crouchley Mar. 1962 21 p 22 refs
(Contract AF 64(500)-9)
(AFCRL-62-353)

This final report summarizes the work carried out at Brisbane in connection with investigations of field-aligned irregularities in the ionosphere and transequatorial propagation of radio waves. Information is given regarding the extent of such irregularity patches, their movements, and the correlations of the observed radar echoes from these irregularities with other ionospheric and geophysical phenomena. An association is proposed between large E-W elongated bands of the irregularities, Van Allen outer belt radiation counts, and an F-region anomaly already associated with the observation of red airglow arcs. The scintillation of radio transmissions passing through the irregularities at directions close to the field direction is probably the most sensitive means of detection of such irregularities. Anomalous transequatorial propagation of H.F. signals is associated with tilted reflection of very low angle radiation and occurs near the time of passage of the evening equatorial rise in F region heights. At midlatitude stations, an intervening normal 1F hop before the anomalous propagation hop may well exert a controlling influence on the use of this type of propagation. "Horizon focusing" effects must be considered in computations involving long distance H.F. propagation field strengths. In analyses of long-distance backscatter data the importance of mixed-mode propagation should be stressed; i.e., the possibility of waves traveling outward by one path and returning to the receiver via a different path having a different time delay. Author

N63-11913 Polytechnic Inst. of Brooklyn. Microwave Research Inst., N.Y.

FREQUENCY MODULATION NOISE

John T. Frankle (M.S. Thesis) Aug. 31, 1962 69 p 27 refs
(Contract AF 18(600)-1505)
(PIBMRI-1041-62)

The noise characteristics of a commercial FM receiver were determined experimentally and compared with the theoretical results of Middleton and Stumpers. The theoretical solutions are derived on the basis of both gaussian and rectangular-receiver IF characteristics. The experimental results follow the rectangular solution for low carrier-to-noise ratio and the gaussian solution for high carrier-to-noise ratio. This is explained by the characteristics of the receiver and FM noise theory. A novel technique, employing an envelope detector, is used to measure carrier-to-noise ratio prior to the FM detector. The thesis also includes information helpful in consolidating the FM noise theory in the literature. Author

N63-11917 Royal Aircraft Establishment, Farnborough (Gt. Brit.)

ANALYSIS OF THE OBSERVATIONS OF THE THIRD SOVIET ARTIFICIAL EARTH SATELLITE AT THE INSTITUTE OF THEORETICAL ASTRONOMY OF THE ACADEMY OF SCIENCES OF THE U.S.S.R. (OBRABOTKA NABLYUDENII TRET'EGO SOVETSKOGO ISKUSSTVENNOGO SPUTNIKA ZEMLI V INSTITUTE TEORETICHESKOI ASTRONOMII AN SSSR)

Yu. V. Batrakov London, Ministry of Aviation, June 1962 8 p 6 refs Transl. by J. W. Palmer from Bull. Inst. Theoret. Astron., 7(1960) 10(93) p 766-769
(RAE Library Translation 998)

Observations of the third artificial earth satellite (1958 δ 2) are analyzed. The variation of the coefficient n' of t^2 in the mean anomaly is illustrated. Author

N63-11947 General Electric Co. Atomic Power Equipment Dept., San Jose, Calif.

IN-CORE INSTRUMENTATION DEVELOPMENT, FIRST TOPICAL REPORT, TASK II, PHASE I—TELEMETERING

A. C. Duckart Washington, AEC Div. of Tech. Information, Mar. 15, 1962 30 p
(Contract AT(04-3)-189)
(GEAP-4026) OTS: $0.75

Telemetering methods are being investigated for their possible application for obtaining data from within the core of a reactor. Results to date show that multiplexing should be used and can be accomplished in one of two ways: electromechanical commutation or mixing of subcarrier oscillators. R.C.M.

09 ELECTRONICS

Includes: circuits and circuit theory; electronic components (e.g., tunnel diodes, transistors, and tubes); and feedback and control theory.

For related information see: 06 Auxiliary Systems; 08 Communications; 15 Instrumentation; 22 Navigation and Guidance; and 25 Physics, Solid-State.

N63-11630 Purdue U. School of Electrical Engineering, Lafayette, Ind.

MICROWAVE ENERGY CONVERSION Technical Report [Jan.-July 1961]

E. M. Sabbagh Wright-Patterson AFB, Ohio, Flight Accessories Lab., May 1962 149 p
(Contract AF 33(616)-7355)
(TR-EE-62-8; WADD-TR-61-48, Pt. III)

A relatively simple method has been devised for mounting 680-1N830 diodes in a series parallel combination to form a single-phase full-wave rectifier for operation at microwave frequencies. The efficiencies attained at 2440 mc are as follows: efficiency of 70% for 9-watts output, 65% for 18.7 watts, 55% for 30.7 watts, and 50% for 34 watts output. An analytical study of bulk semiconductor conversion of microwaves is presented. However, the material used for the experimental part of the project is not satisfactory for use at microwave frequencies. The polarization loss in this material reduces the efficiency from 50% to .05%. Four different tube mounts were tested and their efficiences obtained. These efficiences vary with load resistors, the maximum values lying between 21% and 25% for all setups and for resistors between 2000 and 4000 ohms. Author

N63-11633 Polytechnic Inst. of Brooklyn. Microwave Research Inst., N.Y.

BILINEAR PATTERN CLASSIFIERS

John F. Kampmeier Mar. 12, 1962 31 p 17 refs
(Contract AF 18(600)-1505)
(PIBMRI-996-62; AFOSR-2417)

The purpose of this report is to present an analysis of the requirements for a portion of a general pattern-recognition system, and the design of a classifier which meets those requirements. The problem of pattern recognition is divided into two parts, measurement and classification. Classification alone is considered in this report. It is shown that the function of a classifier can be reduced to the realization of an arbitrary, n-variable switching function. Author

N63-11634 Polytechnic Inst. of Brooklyn. Microwave Research Inst., N.Y.

THE DERIVATION OF NETWORK FUNCTIONS FROM PHASE FUNCTIONS

Sid Deutsch Mar. 6, 1962 23 p
(Contract AF 18(600)-1505)
(PIBMRI-1006-62; AFOSR-2406)

Equations are developed for deriving a network function F(s) given its phase function $\theta(\omega)$. Several numerical examples are given.

In each case, the recurrence of the given $\theta(\omega)$ function in F ($j\omega$) is a means of checking the accuracy of the derived F (s) function. The real part of log F ($j\omega$) yields the log magnitude response, log M (ω). The examples indicate that the mathematical operations of finding F(s) are relatively simple. The equations are also employed to evaluate certain definite log-arithmic integrals. Author

N63-11675 Diamond Ordnance Fuze Labs., Washington, D.C.
A STABLE LOW VOLTAGE REGULATOR
Floyd Allen Mar. 12, 1962 12 p
(DOFL R940-62-2)

A 1.5-volt transistorized d.c. regulator, employing forward-biased diodes as the reference source, was designed and constructed. Regulation of ±0.15% was acheived for input voltages within the range of 9 to 13 volts, and output current changes of 0 to 15 ma. Temperature stability within the range of -20° to 55° C was achieved by using thermistors shunted by resistors in the sampling circuit to compensate for the relatively high-temperature coefficient of the reference diodes. Circuit details and performance curves are given. Author

N63-11744 Illinois U. Coordinated Science Lab., Urbana
A CONSTRAINT MAPPING TECHNIQUE FOR SYSTEM OPTIMIZATION
Stephen J. Kahne Nov. 5, 1962 24 p 7 refs
(Contract DA-36-039-SC-85122)
(R-155)

Physical constraints on complex systems are often specified in both the state space and control space. A technique is presented in this paper for digital computation to determine if the specifications are mutually consistent with the system dynamics and, if so, for mapping all constraints into the control space. The method is applicable to nonlinear, nonstationary systems. However, closed form solutions are given for linear nonstationary systems. Some examples show application of the technique to linear and nonlinear systems. Author

N63-11745 Illinois U. Coordinated Sciences Lab., Urbana
REALIZABILITY CONDITIONS OF SINGLE-CONTACT NETWORKS
Shu-Park Chan Dec. 1962 76 p 16 refs
(Contract DA-36-039-SC-85122)
(R-158)

Single-contact (SC) functions are characterized and a set of necessary realizability conditions are derived which will serve as a testing method for a given function. It is shown that there exist certain classes of functions which satisfy the odd-ring-sum condition but are not SC functions. The correlations between the nontree matrices and the nonrealizable functions are given and are verified by examples which illustrate the reasons for their nonrealizability. It is shown that if a prescribed function fails any one of the tests, it is then determined as a nonrealizable function. If it passes all the tests developed, no conclusions can be made about its realizability. J.R.C.

N63-11814 Joint Publications Research Service, Washington, D.C.
ENGINEERING CYBERNETICS
Aleksey Grigor'yevich Ivakhnenko Jan. 11, 1963 624 p 92 refs
Transl. of the book "Tekhnicheskaya kibernetika", 2nd ed., Kiev, State Publishers of Tech. Lit. of the Ukrainian SSR, 1962
(JPRS-17092) OTS: $26.00

This book on cybernetics covers the following: automation and engineering cybernetics; logical elements for simple relay cybernetics systems; cybernetic systems with internal changes in setting; cybernetic systems with internal changing programs, algorithms, and parameters; cybernetic systems with internally changing nonlinear characteristics or conversion algorithm; cybernetic systems with internal change of structure; basic problems of the general theory of cybernetic automatic control systems; increasing resistance to interference of systems; and combined control as the general case of control of state and quantity. J.R.C.

N63-11851 Lincoln Lab., Mass. Inst. of Tech., Lexington
FUEL-OPTIMAL CONTROL OF A DOUBLE INTEGRAL PLANT WITH RESPONSE TIME CONSTRAINTS
Michael Athans Jan. 7, 1963 38 p 9 refs Preprint
(Supported by Army, Navy, and AF)
(MS-770)

Given the double integral plant $\ddot{y}(t) = u(t), |u(t)| \leq 1$, the control $u(t)$ is determined which, in time interval $[0, T]$, forces the state of the plant to zero, minimizes the fuel consumed, as measured by $\int_0^T |u(t)|\, dt$, and results in a response time T which does not exceed a prespecified multiple of the minimum time. A design of the necessary nonlinear controller is included. Author

N63-11885 Polytechnic Inst. of Brooklyn. Microwave Research Inst., N.Y.
SYMMETRIES OF UNIFORM WAVEGUIDE CONTAINING ANISOTROPIC MATERIALS
Yoshihio Konishi Aug. 20, 1962 31 p 6 refs
(Contract AF-18(600)-1503; Grant AFOSR-62-295)
(PIBMRI-1052-62)

Waveguides which have symmetry have simpler electrical characteristics and equivalent circuits, and the symmetry sometimes serves as better matching characteristics than general waveguides when the waveguide includes anisotropic material. In this paper, the anisotropic conditions under which waveguides can keep the symmetries are discussed. The kind of d.c. magnetic field which may be applied to Ferrite materials so that the symmetry of the waveguide is preserved is described. Author

N63-11914 Polytechnic Inst. of Brooklyn. Microwave Research Inst., N.Y.
CRITICALLY-DAMPED COMPENSATION FOR BROADBAND AMPLIFIERS
Sid Deutsch July 23, 1962 26 p 13 refs
(Contract AF 18(600)-1505)
(PIBMRI-1051-62)

Lossless, critically damped 2-terminal and 3-terminal ladders are considered as a means of compensating for parasitic shunt capacitance in broadband amplifiers. Equations are presented that simplify the design of these ladders. The capacitance and inductance values are tabulated for ladders that contain up to 7 reactive elements. The analysis is extended to the limiting case of an infinite number of elements. The element values and transient responses of these optimum ladders are derived. Using a figure of merit that is based on the slope of the step response at its half-amplitude point, the infinite 2-terminal ladder is 59% better than an uncompensated circuit while the 3-terminal ladder is 117% better. Author

N63-11935 Joint Publications Research Service, Washington, D.C.
SOVIET DEVELOPMENTS IN ELECTRONICS
M. Likhachev et al Jan. 21, 1963 32 p Transl. of 8 articles from Pravda (Moscow) and Izv. (Moscow), Nov. 25, 1962 p 3 and 5, respectively
(JPRS-17220) OTS: $3.60

This report covers the following: the role of electronics in technical progress; microelectronics; automation of mental work; production of electronic components and equipment; the role of the electronic computer in automation; molecular generators; and the surgical recorder. J.R.C.

10 FACILITIES

Includes: airports; lunar and planetary bases; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands and wind tunnels); test ranges; and tracking stations.

For related information see: 06 Auxiliary Systems.

N63-11606 Aro, Inc., Arnold Air Force Station, Tenn.

CRYOGENICS AS APPLIED TO THE DESIGN AND FABRICATION OF A SPACE SIMULATION TEST CELL

S. P. Ansley, Jr. Arnold Engineering Development Center, Jan. 1963 41 p 10 refs
(Contract AF 40(600)-1000)
(AEDC-TDR-62-201)

The unusual features of the Ultrahigh Altitude Rocket Cell J-2A at Arnold Engineering Development Center are described. Emphasis is placed on the cryogenic systems for cooling the diffuser and chamber liner to liquid-nitrogen temperature, and the helium-refrigerated cryopumping surfaces to 20° K. Author

N63-11685 Allis-Chalmers Mfg. Co. Atomic Energy Div., Milwaukee, Wis.

MOBILE ENERGY DEPOT FEASIBILITY STUDY—SUMMARY REPORT, APPENDIXES

S. B. Burwell, J. A. Carlson, R. G. Clark, L. E. Donelan, A. F. Erwin, P. G. Grimes, R. J. Jasinski, T. P. Kruzic, J. P. Manion, S. E. Rohowetz, C. L. Sollenberger, J. F. Thompkins, and W. M. Hawkins, Jr. July 13, 1962 191 p 216 refs
(Contract AT(30-1)-2931)
(ACNP-62015B; NYO-10422, Vol. II)

Appendices to the feasibility study of the mobile energy depot are presented which cover the basic criteria for reactor and fuel utilization, and include articles on the following: the characterization of the fuel and the oxidizer, the safety aspects of handling and storing liquid hydrogen, the control of thermonuclear reactions, the operation of the C-stellarator, the feasibility of a 300-Mwe magnetohydrodynamic powerplant, a literature review of energy utilization, and a discussion of fuel cells. M.P.G.

N63-11727 Congress. House. Committee on Science and Astronautics

CAPE CANAVERAL: THE HOPE OF THE FREE WORLD Report of the Committee on Science and Astronautics, U.S. House of Representatives

Victor L. Anfuso Washington, GPO, May 24, 1962 22 p
(87th Cong. 2nd Sess. Committee Print)

This report describes the 1962 inspection of the Atlantic Missile Range. The projected plans of the AMR are outlined. R.C.M.

N63-11890 Naval Ammunition Depot. Quality Evaluation Lab., Crane, Ind.

CURRENT AND PLANNED CAPABILITIES FOR CONDUCTING ENVIRONMENTAL TESTS

C. M. Austin Oct. 1, 1962 194 p
(QE/C-62-513)

Environmental testing facilities are described in which the following conditions or combination of conditions can be simulated: vibration, both electronic and mechanical; acceleration; shock; impact; temperature with humidity and altitude; temperature with altitude and vibration; tropical climates; high vacuum; fog; fungus; radiation; sand and dust; sunshine; and explosive atmosphere. R.C.M.

N63-11908 National Aeronautical Lab., Tokyo (Japan)

TEST FACILITIES OF TURBO-JET ENGINE COMPONENTS AT N.A.L.

1962 76 p 15 refs In Japanese; English abstract
(NAL-TR-24)

As a part of the six-year plan for the establishment of the research facilities in the National Aeronautical Laboratory, the test facilities of main components of the turbo-jet engine, viz., compressor, turbine, and combustor research facilities, including cascade tunnels and the compressed air supply system, have been set up in the Propulsion Division. Plannings, constructions, and functions of these facilities are reported. Author

11 FLUID MECHANICS

Includes: boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence.

For related information see: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings and Control Surfaces; 13 Heat Transfer; and 24 Physics, Plasma.

N63-11627 General Dynamics/Astronautics. Space Science Labs., San Diego, Calif.

INVISCID AND VISCOUS HYPERSONIC NOZZLE FLOW WITH FINITE RATE CHEMICAL REACTIONS

E. S. Levinsky and J. J. Brainerd Arnold Engineering Development Center, Jan. 1963 53 p 19 refs
(Contract AF 40(600)-925)
(AEDC-TDR-63-18)

Procedures are developed for determining the inviscid core and boundary-layer development in diverging nozzles, with high enthalpy reservoir conditions in which the gas composition has been displaced from equilibrium by chemical relaxation. A finite difference procedure, based on the method of characteristics, is used for the inviscid flow with finite rate chemical reactions. Laminar boundary-layer profiles, based on local similarity, are obtained by integrating the coupled boundary layer and chemical reaction equations outward from the nozzle wall. Free-stream boundary conditions on the chemical specie concentrations and the thermodynamic variables are satisfied by iterating on the unknown concentrations and derivatives at the wall. Numerical calculations are presented for the AEDC, VKF Low Density Tunnel and the Convair Hypersonic Shock Tunnel. The results indicate that effects of chemical reactions in the boundary layer are restricted to the region in which the core flow has not yet frozen and in which the boundary layer is thin. When the boundary layer is thick enough to influence the core expansion, gas phase reactions are frozen. Author

N63-11678 Massachusetts Inst. of Tech. Aerophysics Lab., Cambridge

THE EQUATIONS OF CONSERVATION FOR MULTICOMPONENT REACTING GAS FLOWS

Fred E. C. Culick Sept. 1962 30 p 10 refs
(Contract AF 49(638)-245)
(Tech. Rept. 48; MIT-DSR-8180)

The derivation of the conservation equations for multicomponent gas flows is discussed briefly from the point of view of classical kinetic theory and, in somewhat greater detail, within the principles of continuum theory. The chief objective is to clarify certain points regarding the "diffusion stress tensor." Author

N63-11688 Naval Ordnance Lab., White Oak, Md.

THEORETICAL CALCULATIONS ON THE SHOCK INITIATION OF SOLID EXPLOSIVES

Julius W. Enig and Fred T. Metcalf Nov. 1962 34 p 25 refs
(NOLTR-62-160)

Theoretical calculations describing the initiation in heterogeneous TNT, RDX, Tetryl, Comp B, Pentolite, and 75/25 Cyclotol, produced by shocks up to 37 kilobars, are given. The "hot spot" initiation mechanism is simulated by using appropriate equations of state of the explosives, and the resultant growth from shock to detonation wave is shown to be in qualitative agreement with experimental results. The shock wave in the explosive travels with increasing velocity due to the release of energy during chemical reaction in the neighborhood of the shock front, and then takes on a constant value upon reaching full detonation velocity. Numerical experiments show that the qualitative ordering of the sensitivity of the 6 explosives, based on one-dimensional gap-test calculations, is the same as that obtained from the U.S. Naval Ordnance Laboratory experimental gap test. Author

N63-11712 Armour Research Foundation, Chicago, Ill.

INTERIOR BALLISTIC ANALYSIS OF A TRAVELING CHARGE HYPERVELOCITY GUN PART I—MATHEMATICAL MODEL

L. A. C. Barbarek and M. S. Nusbaum [1962] 14 p 2 refs
(Contract AF 08(635)-902)

This is a report of the analytical and experimental investigation of the interior ballistics of a traveling-charge gun. The mathematical model that was developed and the traveling-charge gun used for the experimental investigation are described. The results of the firings up to a certain date are presented. Author

N63-11731 California Inst. of Tech. Graduate Aeronautical Labs., Pasadena

A 17-INCH DIAMETER SHOCK TUBE FOR STUDIES IN RAREFIED GASDYNAMICS

H. W. Liepmann, Anatol Roshko, Donald Coles, and Bradford Sturtevant Repr. from Rev. Sci. Instr., v. 33, no. 6, June 1962 p 625-631 8 refs
(Supported by NASA)
(Guggenheim Aeron. Lab., Calif. Inst. of Tech. Publ. 525)

A shock tube for studying problems in rarefied gasdynamics is described. The motivation for operating at low density (to increase the length and time scales of certain interesting flows) and the effect of low density on the performance and design of the shock tube are discussed. In order to guarantee uniform and reproducible shock waves of moderate strength, the configuration of the tube is conventional. However, innovations are introduced (for example in the suspension, the pumping system, and the diaphragm loading and rupturing mechanism) to simplify the operation of the large facility. Care in the design of the tube as a vacuum system has resulted in a leak rate of less than 0.01 μ Hg per hour. A series of shakedown runs at relatively high pressures has shown, for example, that the reproducibility of a given shock Mach number is $\pm 0.6\%$. Author

N63-11795 General Electric Co. Space Science Lab., Philadelphia, Pa.

ON THE STABILITY OF AXI-SYMMETRICAL WAKES OF A BINARY MIXTURE OF COMPRESSIBLE FLUIDS

S. I. Pai and H. Li Aug. 1962 23 p 10 refs
(Contract 04(647)-607)
(R62SD79-Class I)

The stability equations of an axisymmetric flow of a binary mixture of compressible fluids have been derived and studied. As in the incompressible case, the stability equations may be reduced approximately to the corresponding equations of two-dimensional flow by proper transformation. An approximate formula for minimum critical Reynolds number of stability is suggested for subsonic and low supersonic Mach numbers, and examples for an axisymmetrical wake of a compressible flow are given. Author

N63-11800 Aberdeen Proving Ground. Ballistic Research Labs., Md.

SOME EXPERIMENTS WITH THE LIQUID-FILLED, IMPULSIVELY STARTED, SPINNING CYLINDER

Gene Sokol Sept. 1962 21 p 3 refs
(BRL-TN-1473)

Some experiments with the liquid-filled, impulsively started spinning cylinder are described. The main emphasis in these experiments was directed toward studies of secondary motions within the fluid. The variables of these experiments were the geometry of cylindrical cavity and fluid viscosity. Author

N63-11833 National Aero- and Astronautical Research Inst., Amsterdam (Netherlands)

INVESTIGATIONS ON THE SUPERSONIC FLOW AROUND BODIES

P. J. Zandbergen (Ph. D. Thesis, Tech. U. of Delft) 1962 111 p 28 refs Summary in Dutch
(Supported by the Netherlands Aircraft Development Board)
(*Its* Reports and Transactions, v. 27, 1962; Tech. Rept. G. 25)

The supersonic flow around axially-symmetric and quasi axially-symmetric bodies is investigated with a twofold purpose. One purpose is to determine whether or not the linearized potential flow theory can give an adequate description of the flow-field around such bodies. The other purpose is to forward more reliable methods of computation for those cases where the results of the investigations lead to the conclusion that this theory is inadequate. Author

N63-11848 Tokyo U. Aeronautical Research Inst. (Japan)

BOUNDARY-LAYER TRANSITION BY ISOLATED ROUGHNESS

Hiroyuki Komoda, Yasuo Komatsu (Nihon U.), Itiro Tani, and Matsusaburo Iuchi Nov. 1962 18 p 13 refs
(*Its* Rept. 375 (Vol. 28, No. 7))

Results of hot-wire measurements are presented on transition in laminar boundary layer along a flat plate with zero pressure gradient in the presence of an isolated roughness element. Transition occurs in the region of a wedge whose vertex moves rapidly forward with slightest increase in stream velocity or roughness height until finally it reaches the roughness element. The critical condition that just causes a wedge of turbulence to originate from roughness is governed by a critical value of the roughness Reynolds number R_k, which is based on the roughness height and the velocity in the laminar boundary layer at the height of roughness. The critical value of R_k is a slowly decreasing function of the transition Reynolds number R_t, based on the free-stream velocity and the distance from leading edge to roughness location. The spanwise distribution of mean velocity in the boundary layer behind a roughness element for subcritical values of R_k is indicative of the presence of streamwise vortices as first observed by Gregory and Walker. Except for the station close behind roughness, a horseshoe-shaped vortex wrapped round the front of roughness gives a predominant effect on mean velocity distribution, producing a primary peak behind the centerline of roughness, and a valley and a secondary peak outside. This three-dimensional deformation of mean velocity field is considered to account for the critical behavior of transition movement. Controlled two-dimensional disturbances, created by a vibrating-ribbon, develop downstream in a way respectively characteristic of the central peak section, valley section, and outside peak section. The disturbances are most strongly amplified in the outside peak section, until breakdown of laminar flow takes place at a downstream station. This breakdown corresponds to the beginning of a turbulent wedge at that station. Author

N63-11880 Aerospace Corp. Aerodynamics and Propulsion Research Lab., El Segundo, Calif.

AN APPROXIMATE ANALYSIS OF SIMULTANEOUS GAS-PHASE AND SURFACE ATOM RECOMBINATION FOR STAGNATION BOUNDARY LAYER

P. M. Chung and S. W. Liu Nov. 26, 1962 14 p 10 refs
(Contract AF 04(695)-169)
(TDR-169(3230-12)TN-4; SSD-TDR-62-194)

The concept of equivalent surface reaction is developed for gas-phase recombination at the stagnation region of blunt bodies. This concept is based on the fact that the chemical state of a nonequilibrium, highly cooled boundary layer is largely determined by the recombination that occurs near the wall. An equation based on this concept is shown to predict the heat transfer to a noncatalytic surface to within a few percent of the more accurate existing results. The equation is generalized to apply to the case in which surface catalytic recombination occurs simultaneously with gas-phase reaction.

Author

N63-11883 Hydronautics, Inc., Laurel, Md.

ON THE PULSATION OF FINITE, VENTILATED CAVITIES

C. C. Hsu and C. F. Chen Nov. 1962 36 p 6 refs
(Contract Nonr-3319(00))
(Tech. Rept. 115-4)

The phenomenon of cavity resonance is explained as an interaction between the flow of the surrounding liquid and the compression and expansion of the contained gas. In this paper, the general solution to the linearized problem of a symmetrical forebody performing symmetrical, harmonic motion, in an infinite medium, with a cavity pressure which is varying harmonically, is presented. The phenomenon of cavity resonance behind a stationary slender wedge in an infinite medium is studied in detail; the results show that self-excited pulsations at discreet frequencies are possible. It is shown that the resonance frequencies are independent of the actual size of the slender wedge; and the occurrence of resonance depends on the property of the contained gas through the equivalent Mach number M^*, which is defined as $(\rho U^2/\rho_g a_g^2)^{1/2}$, where ρ, ρ_g, U, a_g are the density of the liquid, density of the gas, uniform speed of the flowing liquid, and the speed of sound of the gas, respectively. The first four resonance frequencies calculated by the present theory are somewhat higher than those observed experimentally by Silberman and Song for a normal plate in a free jet tunnel, although the trend is quite similar. The values of M_n^*/M^*, where the subscript n denotes the nth stage resonance, compare fairly well. The theoretical and experimental values of M^* cannot be compared directly because of the difference in the forebody shape; they are, nevertheless, of comparable order of magnitude.

Author

N63-11884 Technical Research Group, Syosset, N.Y.

THE LATERAL CONTROL RESPONSE OF THE HYDROSKIMMER CRAFT

H. S. Bluston May 23, 1962 69 p 7 refs
(Contract NObs-4433)
(TRG-158-FR)

Methods are given for obtaining the Hydroskimmer response for the three lateral degrees of freedom and both rudder and variable nozzle control systems. Solutions are obtained in terms of Laplace Transforms for any control input, and in real time for a step-control input. The solutions for the step input depend on functions of the craft stability and control derivatives, and these functions are presented graphically in terms of the fundamental craft parameters. The parameters considered are the rudder chord, rudder area, rudder longitudinal distance from the C.G., craft beam, jet thickness, and jet exit height. Skeg and water depression effects are briefly discussed.

Author

N63-11926 Aeronautical Research Council (Gt. Brit.)

THE EQUILIBRIUM PISTON TECHNIQUE FOR GUN TUNNEL OPERATION

R. A. East (Southampton U.) and L. Pennelegion (Natl. Phys. Lab.) London, HMSO, 1962 25 p 11 refs
(CP-607; previously issued as ARC-22852) Available from HMSO: 4s

If the piston mass and initial barrel pressure are chosen correctly, then the peak pressures associated with the gun tunnel are avoided. A condition may be achieved where the piston has no overswing; this has been confirmed experimentally. Calculations of stagnation pressure showing the effect of area change at the diaphragm station are given using air, helium, and hydrogen as driving gases, and air as the driven gas.

Author

N63-11927 Aeronautical Research Council (Gt. Brit.)

SOME THREE-DIMENSIONAL EFFECTS OF ROTATING STALL

S. L. Dixon (Liverpool U.) London, HMSO, 1962 38 p 21 refs
(CP-609; previously issued as ARC-22863) Available from HMSO: 5s. 6d.

A small perturbation analysis of rotating stall in inviscid, incompressible flow is developed from an analysis of Yeh. An isolated blade row is considered having a blade height which is not small compared to the mean radius. A criterion is derived for the occurrence of rotating stall, the speed of stall propagation, and the possible number of stall cells involved. From this, the frequency of circumferential flow disturbances can be obtained. Application of the analysis to an example is given. Possible explanations are suggested for the observed changes in number of stall cells.

Author

N63-11946 Minnesota U. St. Anthony Falls Hydraulic Lab., Minneapolis

TANDEM INTERFERENCE EFFECTS OF FLAT NONCAVITATING HYDROFOILS

Lorenz G. Straub, J. M. Wetzel and W. H. C. Maxwell May 1962 46 p 12 refs
(Contract Nonr-710(41))

Experimental measurements were made of the interference effect of two submerged, flat, noncavitating hydrofoils of finite span in tandem. The surface wave generated by a single foil was measured in the longitudinal and lateral directions. Downwash angles were determined from the experimental data for various foil separations and submergences. Comparison of the results with theory was favorable. Limited measurements were also made of the oscillatory lift and drag forces for a foil moving through a progressive wave train. The data agreed with quasi-steady theory for the lower frequencies of encounter. At the higher frequencies of encounter, consideration of unsteadiness effects improved the correlation.

Author

12 GEOPHYSICS

Includes: auroral phenomena; upper atmospheric studies; cartography; geodesy; and geomagnetism.

For Van Allen belts see: 28 Space Radiation.

For related information see: 05 Astronomy and Astrophysics; 21 Meteorology; and 29 Space Sciences.

N63-11578 National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

CORRECTION TO THE SECOND APPROXIMATION CALCULATION OF THE GEOMAGNETIC FIELD, SOLAR WIND INTERFACE

David B. Beard and Edward B. Jenkins Repr. from J. Geophys. Research, v. 67, no. 12, Nov. 1962, p 4895-4896 1 ref

A correction is made in the second approximation calculation of the geomagnetic-field solar-wind interface. The revised approximation makes the second approximation very sensitively dependent on $K_r(\theta)$—the ratio of one-half the radial component of the magnetic field due to nonlocal surface currents to the radial component of the geomagnetic field. A table is presented for surface radii in meridian plane for various constant values of K_r. (J.R.C.)

N63-11591 Politecnico di Milano (Italy)
THE INSTRUMENTS FOR NUMERICAL PHOTOGRAMMETRY
Luigi Solaini Oct. 1962 25 p Presented at the Intern. Soc. for Photogrammetry Meeting of the II-III and IV Commissions, Milan, Oct. 1-5, 1962

Two types of instruments are used in numerical photogrammetry to obtain the coordinates of ground points precisely and automatically: coordinate recorders added to the normal plotting apparatus, and stereocomparators. The use of electronic computers with stereocomparators has solved the double problem of relating plate coordinates and ground coordinates. Analytical plotting apparatus are being developed to supply the same spatial coordinates for each plotted point as the conventional plotting apparatus, and yet offer the advantages of the stereocomparator-computer system. Plastic films are being developed which are rigid enough to be flattened out and yet are free from sensitive local deformations, and photographic lens distortions are being reduced. All of these developments are increasing the precision of photogrammetry. M.P.G.

N63-11592 International Society for Photogrammetry, London (Gt. Brit.)
THE ANALYTICAL PLOTTER
Gino Parenti Oct. 1962 13 p Presented at the Intern. Soc. for Photogrammetry Meeting of the II-III and IV Commissions, Milan, Oct. 1-5, 1962

The analytical plotter is substantially a two-stage stereocomparator which has the capability to receive and introduce the corrections on the plate coordinates. The corrections represent the differences between the plate coordinates and the coordinates of a model whose scale is chosen as close as possible to that of the photographs. The fundamental principle of the analytical plotter is to introduce in real time the plate corrections, which are not only a function of the fixed parameters, but also of the model coordinates which are varied by the operator. It is evident that the analytical plotter's accuracy, when functioning with digital computers, is characterized not only by the precision of the mechanical parts but also by the size of the pulse increments. J.R.C.

N63-11597 National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THEORETICAL MODELS FOR THE SOLAR-CYCLE VARIATION OF THE UPPER ATMOSPHERE
Isadore Harris and Wolfgang Priester Repr. from J. Geophys. Research, v. 67, no. 12, Nov. 1962 p 4585-4591 7 refs Previously processed as a preprint; for abstract see N62-12969 09-12

Models of the upper atmosphere for different levels of solar activity have been calculated by solving the heat-conduction equation under quasi-hydrostatic conditions. In these calculations the fluxes of both heat sources (EUV and corpuscular heat source) are varied in proportion to the long term averages of the 10.7-cm solar fluxes in order to account for different levels of solar activity during the solar cycle. The physical properties (temperature, density, scale height, and mean molecular weight) are illustrated as functions of local time and of altitudes between 120 and 2050 km for five different values of S. Author

N63-11607 Pennsylvania State U. Ionosphere Research Lab., University Park
SATELLITE OBSERVATIONS OF THE EQUATORIAL IONOSPHERE
L. J. Blumle Repr. from J. Geophys. Research, v. 67, no. 12, Nov. 1962 p 4601-4605 16 refs
(NASA Grant NsG-114-61)

A method of measuring total electron content by observing the Faraday effect on satellite beacon transmitters at a station located on the magnetic equator is presented. The method is applied to data observed at Huancayo, Peru, between September 1961 and January 1962. The total electron content at the magnetic equator has been found to have nearly a ten-to-one diurnal variation with a maximum of 4×10^{17} m^{-2} near 1500 hours. Values of the thickness parameter $\int Ndh/N_{max}$ for the observational period show an anomalous increase around layer sunrise which is attributed to a departure from thermal equilibrium. Author

N63-11692 Queen's U., Belfast (Gt. Brit.)
RESEARCH ON PHYSICS OF THE UPPER ATMOSPHERE Technical (Final) Report
D. R. Bates, A. Dalgarno, A. H. Jarrett, B. L. Moiseiwitsch, and A. L. Stewart June 30, 1962 81 p refs
(Grant AF-EOARDC 61-16)
(AFCRL-62-1138)

A variational method is used in a study to determine the effect of configuration interaction represented by the second order term of the wave function depicting the ground state of the two-electron systems in inverse powers of the nuclear charge. Comparison is made with the similar calculation carried out by Schwartz in 1962, using the method of incomplete separation of variables. Author

N63-11693 Royal Technical U. of Denmark. Ionosphere Lab., Copenhagen
THE CORRELATION BETWEEN EARTH CURRENTS AT GODHAVN, GREENLAND AND MAGNETIC DISTURBANCES Technical Note No. 1
Eigil Ungstrup and Bent Møller Petersen June 1, 1962 18 p 3 refs
(Contract AF 61(052)-298)
(*Its* Rept. 10; AFCRL-62-1139)

From a detailed treatment of a series of provisional earth-current measurements made at Godhavn, Greenland, it is shown that it is possible to use earth-current measurements instead of magnetic measurements as indicators of ionospheric activity. Author

N63-11762 Stanford U. Radioscience Lab., Calif.
IONOSPHERIC ELECTRON CONTENT AND VARIATIONS MEASURED BY DOPPLER SHIFTS IN SATELLITE TRANSMISSIONS Technical Report No. 2
Fernando de Mendonça Oct. 25, 1961 138 p 23 refs Previously processed as a preprint; for abstract see N62-10073 01-09
(NASA Grant Nsg 30-60)
OTS: $10.50 ph, $4.34 mf

A method is derived for calculating ionospheric electron content by comparison of the Doppler shifts imparted to two harmonically related frequencies transmitted from a satellite. Rotation of polarization of the wave caused by the Faraday effect can be combined with the Doppler information to give an independent measurement of the same quantity, thus providing a verification of the results and an increase in accuracy. The Doppler method is then applied to the analysis of several passages of the satellite Transit 2-A (1960 η_1) during the months of July through October 1960. The observations were made at Stanford, California, on the frequencies of 54 mc and its sixth harmonic. Differences in the electron content of up to 30 percent between two subionospheric points, separated by as little as 1000 km, were observed on several passages during magnetically quiet days. On some magnetically disturbed days, these differences increased to over 50 percent for the same separation. Author

N63-11783 Alaska U. Geophysical Inst., College

THE MAGNETIC FIELD OF THE QUIET-TIME PROTON BELT

Syun-Ichi Akasofu, Joseph C. Cain (NASA. Goddard Space Flight Center), and Sydney Chapman (High Alt. Obs.) Repr. from J. Geophys. Research, v. 67, no. 7, July 1962 p 2645-2647 3 refs
(NASA Grant NsG-201-62)

The distortion of the earth's magnetic field produced by the proton belt is discussed. The magnetic field is calculated numerically, to a first approximation, for an analogous model belt in a steady state. It is estimated that in the equatorial plane, at the earth's surface, the magnetic field produced by this belt is of the order of 38 γ. It is directed southward. The maximum field reduction is of the order of 72 γ at 4.1α(α=earth's radius); this is 15.5 percent of the dipole field intensity at this point. Beyond 6.7α, the belt increases the earth's field. Author

N63-11842 Joint Publications Research Service, Washington, D.C.

ACCURACY OF GEODETIC TOPOGRAPHIC WORK IN THE METHODS OF FIELD ESTABLISHMENT AND FREQUENCY SOUNDING

A. P. Pryakhin Jan. 17, 1963 16 p 8 refs Transl. from Razved. i Promysl. Geofiz. (Moscow), no. 43, 1962 p 72-79
(JPRS-17175) OTS: $1.60

A study is made of the accuracy of geodetic topographic work in field establishment and frequency sounding. The altitude of the registration points, Q, must be calculated with a maximum error of 2% of the depth of the base horizon which is 1:100,000. In this manner, the error in topogeodetic operations is directed primarily toward the accuracy of calculating the geometrical parameters of the drawing. The average quadratic error, obtained from experimental data during 1958 and 1959, was ±5%. An analysis of the average quadratic errors shows that in order to calculate the coordinates and the altitudes of Q-points and the values making up the K-factor, there is no need, in many instances, to carry out instrumental field topographic operations. J.R.C.

N63-11859 Avco Corp. Research and Advanced Development Div., Wilmington, Mass.

POLAR CAP AND AURORAL ZONE ABSORPTION EVENTS DURING THE FIRST SIX MONTHS OF THE IGY Scientific Report No. 18

Geoffrey E. Hill Jan. 9, 1963 9 p Repr. from J. Phys. Soc. of Japan, v. 17, suppl. A-I, 1962, International Conf. on Cosmic Rays and the Earth Storm, Part I
(Contract AF 19(604)-4092)
(RAD-TR-62-64; AFCRL-62-937)

Investigation of polar cap absorption events during the first 6 months of the IGY was conducted by the use of worldwide ionosonde data. Synoptic maps of the parameter f_{min} were constructed at intervals of 3 hours. Many auroral zone and polar cap absorption events were found. In this paper, only the polar cap events are reported. In addition to the events reported by riometer techniques, several additional ones were found. Analysis of all these events is made to give the starting and ending times and their relationship to solar flare and radio noise data and geomagnetic observations. Author

N63-11893 Queensland U., Brisbane (Australia)

TRANSEQUATORIAL PROPAGATION ANALYSIS: IONOSPHERIC HEIGHT AND FREQUENCY PLOTS Scientific Report No. 8

J. A. Thomas Mar. 1962 27 p 8 refs
(Contract AF 64(500)-9)
(AFCRL-62-345)

A method of obtaining ionospheric data representative of regions where no ionosondes exist is described, and base height and critical frequency plots for the F_2 region are determined for a variety of great circle paths through Brisbane. The existence of ionospheric tilts capable of giving anomalous propagation of H.F. waves is demonstrated, and several factors controlling the propagation conditions are discussed. Author

N63-11897 Queensland U., Brisbane (Australia)

FIELD-ALIGNED IONIZATION IRREGULARITIES. AN INVESTIGATION OF ECHOES OBSERVED FROM BRISBANE Scientific Report No. 13

E. W. Dearden Mar. 1962 93 p 42 refs
(Contract AF 64(500)-9)
(AFCRL-62-350)

The areas of echo from field-aligned ionization irregularities (F.A.E.) are studied and explanations proposed for various features of their behavior. A general result is that the observation of high-altitude field-aligned irregularities by means of refracted exploring waves is subject to a severe ionospheric control. It is believed, however, that these observations cannot be readily made in any other way. Author

N63-11898 Queensland U., Brisbane (Australia)

FIELD-ALIGNED IRREGULARITIES IN THE E_s REGION Scientific Report No. 14

G. L. Goodwin and J. A. Thomas Mar. 1962 20 p 9 refs
(Contract AF 64(500)-9)
(AFCRL-62-351)

A comparison of the known diurnal and seasonal behavior of "constant height" (E_{sc}) and "sequential" (E_{ss}) sporadic-E echoes with that of field-aligned (E_d) echoes from the E-region indicated that an increase in occurrence of E_d echoes generally coincided with an increase in occurrence and/or range spreading of E_{sc} echoes, but was independent of the presence of E_{ss} echoes. A detailed comparison indicated that at night in October, and in day- and night-time in December, almost all E_{sc} clouds detected at frequencies at least down to 2.5 mc/s have irregularities which are field-aligned. Author

N63-11899 Queensland U., Brisbane (Australia)

RADAR OBSERVATIONS OF FIELD-ALIGNED IRREGULARITIES DURING THE TWO MAGNETICALLY DISTURBED DAYS, MAY 6TH, 1960 AND MAY 8TH, 1960 Scientific Report No. 15

Evelyn M. Matthew and E. W. Dearden Mar. 1962 35 p 17 refs
(Contract AF 64(500)-9)
(AFCRL-62-352)

Further evidence is presented for an association between the Outer Van Allen Belt, the F.A.I. arcs observed from Brisbane, and the 6300Å airglow arcs. The phenomena associated with a discontinuous increase in the northward speed of an F.A.I. arc are studied, and the event is interpreted as arising from some form of impact on the magnetosphere. The occurrence of an annular echo, and its associated phenomena, is interpreted as an observation of the Outer Belt dumping radiation into the atmosphere. Author

13 HEAT TRANSFER

Includes: ablation; cooling; heating; and other thermal effects.

For aerothermodynamics see: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; and 03 Aerodynamics of Wings and Control Surfaces.

For combustion see: 26 Propellants and Combustion.

For related information see: 11 Fluid Mechanics.

N63-11563 Cincinnati U., Ohio

THERMAL CONDUCTIVITY OF ANISOTROPIC SOLIDS AT HIGH TEMPERATURES. PART I. THE THERMAL CONDUCTIVITY OF MOLDED AND PYROLYTIC GRAPHITES

Michael Hoch and Joseph Vardi Wright-Patterson AFB, Ohio, Directorate of Materials and Processes, Nov. 1962 27 p 12 refs
(Contract AF 33(616)-7123)
(ASD-TDR-62-608, Pt. I)

A method has been developed for the determination of the thermal conductivities of anisotropic solids under conditions of two-dimensional, steady-state heat conduction in a cylinder of finite length heated in vacuum by high-frequency induction and radiating heat to the surroundings. The method has been used to determine the radial thermal conductivity, k_r, and the axial thermal conductivity, k_z, of molded ZT-type and pyrolytic graphite in the temperature range 1200° to 2200° K. For ZT-type graphite $k_z/k_r = -0.10116 + 2.00191 \times 10^{-4} \times T$ (1260°K<T<2199°K); for pyrolytic graphite, $k_z/k_r = 0.0376$ at 1817°K. Author

N63-11700 Naval Ordnance Lab., White Oak, Md.

POLARIS PROGRESS REPORT FOR NOVEMBER 1962—MATHEMATICS DEPARTMENT

[1962] 2 p

This report on the Polaris program discusses the development of an analytic procedure for finding the heat flow through multilayered materials, the compilation of a heat-conduction program on the 7090 computer, and the development of finite-difference methods for improving boundary-layer heat-transfer computations. D.B.

N63-11742 National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

NITROGEN AND OXYGEN ATOM RECOMBINATION AT OXIDE SURFACES AND EFFECT OF TESLA DISCHARGE ON RECOMBINATION HEAT TRANSFER

George M. Prok Washington, NASA, Jan. 1963 19 p 27 refs
(NASA TN D-1567) OTS: $0.50

Recombination coefficients for nitrogen and oxygen atoms on metallic oxides of calcium, copper, chromium, germanium, iron, and zinc were determined over a small temperature range. Also, the effect caused by a Tesla discharge on the recombination heat transfer of nitrogen and oxygen atoms at surfaces of copper, copper oxide, iron, iron oxide, calcium oxide, and zinc oxide was observed. The recombination coefficient results show that the recombination efficiency of a surface can increase, decrease, or remain constant with increasing temperature, depending on the surface and the recombining atoms. The Tesla discharge always caused a decrease in the recombination heat transfer of oxygen atoms; the average decrease was about 12 percent. For nitrogen atoms, the Tesla discharge caused a maximum increase in the recombination heat transfer of 6.4 percent at a zinc oxide surface and a maximum decrease of 43.7 percent at a copper oxide surface. Author

N63-11751 Argonne National Lab., Ill.

ANALOG COMPUTATION OF TEMPERATURE DISTRIBUTION IN SOLIDS WITH ELECTRICAL HEAT-GENERATION AND TEMPERATURE-DEPENDENT PROPERTIES

Darrel G. Harden and Lawrence T. Bryant Nov. 1962 19 p 6 refs
(Contract W-31-109-eng-38)
(ANL-6645)

A problem which frequently arises in experimental heat transfer work is that of determining the surface temperature of a tube in which heat is generated electrically. Solution of this problem involves a temperature measurement of the opposite surface to which a correction factor, the temperature drop through the tube wall, must be applied. This temperature drop is obtained through the solution of the differential equation governing the temperature distribution in the tube wall; however, in the case of temperature-dependent properties of thermal conductivity and electrical resistivity, the governing equation is nonlinear, which necessitates special solutions. In this study, a hypothetical surface-temperature problem is established, and the solution of the governing nonlinear differential equation is accomplished by means of an electronic analog computer. Assuming variable properties, the example used in this study is that of a one-dimensional steady-state heat flow through both a thick- and a thin-walled tube. Author

N63-11811 Royal Air Force. Inst. of Aviation Medicine, Farnborough (Gt. Brit.)

THE AIR-VENTILATED SUIT—EXPERIMENTS TO INVESTIGATE THE IMPROVEMENT IN THE THERMAL INSULATION DUE TO AIR FLOW THROUGH THE MATERIAL

K. E. Spells and O. J. Blunt Air Ministry. Flying Personnel Research Committee, Aug. 1962 67 p 15 refs
(FPRC/1202)

Measurements were made of the rate of heat flow from a large cylinder around which was fitted a ventilated jacket. The ventilating gas was supplied at the temperature of the cylinder (thermostatically controlled), and flowed radially outwards through the jacket material to produce the so-called dynamic insulation effect. Variables studied included air and carbon dioxide as ventilating gases, gas flow rate, and two jackets' thicknesses. Temperatures of the external surface of the jacket were also determined for these conditions. Heat-flow measurements only were made in experiments when cloths of different air permeability formed the external jacket surface. These latter experiments included some with a fabric having one face aluminized. The temperatures of the external jacket surface determined for different gas rates are consistent with the assumption, made in the extension of the theoretical work, that at this surface there operates the boundary condition of heat flux proportional to the temperature difference from ambient. Author

N63-11871 California U., Berkeley. Inst. of Engineering Research

THE INFLUENCE OF SHOCK WAVE-BOUNDARY LAYER INTERACTION ON HEAT TRANSFER TO AN AXISYMMETRIC BODY [Final Technical Report]

R[oy] S[cott] Hickman Wright-Patterson AFB, Ohio, Aeronautical Research Labs., Oct. 1962 123 p 22 refs
(Contract AF 33(616)-6161)
(ARL-62-442)

The local heat flux to hemisphere cylinder models was measured in the Low Density Wind Tunnel at the University of California. Two different methods were developed and five individual models were tested. Data were obtained throughout the Mach number range of 2 to 6, with Reynolds numbers behind the shock varying from 38.5 to 1720. The stagnation-point data were found to agree with continuum boundary-layer theory at the higher Reynolds numbers and with Van Dyke's second-order boundary-layer theory at the lower Reynolds numbers. In addition, the pressure distribution was measured on cooled and uncooled models and was found to agree well with modified Newtonian theory throughout the Reynolds number range. Author

N63-11915 Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio

THERMAL RADIATIVE PROPERTIES OF SELECTED MATERIALS, VOLUME 1

W. D. Wood, H. W. Deem, and C. F. Lucks Nov. 15, 1962 192 p 25 refs
(Contract AF 33(616)-7747)
(DMIC-177, Vol. 1)

This compilation of data on thermal radiative properties also includes a brief discussion of the basic fundamentals and methods for measuring these properties. Thermal radiative data (emittance, reflectance, and absorptance) are included for the following materials: titanium and its alloys; stainless steels; iron-, nickel-, and cobalt-base superalloys; the refractory metals (chromium, columbium, molybdenum, tantalum, and tungsten) and their alloys; coated materials for elevated-temperature service; and ceramics and graphite. Author

N63-11916 Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio

THERMAL RADIATIVE PROPERTIES OF SELECTED MATERIALS, VOLUME 2

W. D. Wood, H. W. Deem, and C. F. Lucks Nov. 15, 1962 280 p 11 refs (For abstract see N63-11915 04-13)
(Contract AF 33(616)-7747)
(DMIC-177, Vol. 2)

N63-11943 Bettis Atomic Power Lab., Westinghouse Electric Corp., Pittsburgh, Pa.

CHIC NUMERICAL STUDIES FOR REACTOR THERMAL TRANSIENTS

G. Birkhoff, T. F. Kimes, and L. L. Lynn *In its* Bettis Technical Review: Reactor Technology. Dec. 1962 p 73-83 6 refs (See N63-11937 04-23) OTS: $2.25

Several sets of difference equations for calculating the heat transfer from fuel plates in a single coolant channel of a nuclear reactor core are analyzed by numerical experiments performed by the three CHIC programs. The comparison of the results of simulating an underflow and an overpower transient indicate that the equations used in the Bettis MIM 01 program are the most accurate and most stable equations of all those investigated. Author

14 HUMAN BEHAVIOR

Includes: crew training and evaluation; piloting; psychological factors.

For simulators see: 10 Facilities.

For related information see: 16 Life Sciences.

N63-11593 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS FROM VOPROSY PSIKHOLOGII (PROBLEMS OF PSYCHOLOGY)

Nov. 29, 1962 92 p 63 refs Transl. of 9 articles from Voprosy Psikhologii (Moscow), no. 3, 1962 p 3-26, 37-44, 95-105, 149-155, 173, 177-184, and 190
(JPRS-16404) OTS: $8.10

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1. SOME MEANS OF INCREASING THE EFFICIENCY OF AN OPERATOR'S WORK IN A MAN-AUTOMATIC MACHINE SYSTEMS D. A. Oshanin and V. F. Venda (Central Sci. Res. Inst. of Comprehensive Automation, Moscow) p 27-44 (See N63-11594 04-14)
2. STUDY OF THE ROLE OF THE PERSONAL FACTOR IN THE CONTROL OF POWER PLANT ELECTRICAL EQUIPMENT (ON THE PSYCHOLOGICAL MANIFESTATIONS OF THE BASIC PROPERTIES OF THE HUMAN NERVOUS SYSTEM IN WORK ACTIVITY) K. M. Gurevich and S. S. Gadzhiyev (Moscow Regional Power System Administration) p 45-54 5 refs (See N63-11595 04-14)
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N63-11594 Joint Publications Research Service, Washington, D.C.

SOME MEANS OF INCREASING THE EFFICIENCY OF AN OPERATOR'S WORK IN MAN-AUTOMATIC MACHINE SYSTEMS

D. A. Oshanin and V. F. Venda Transl. from Voprosy Psikhologii (Moscow), no. 3, 1962 p 23-26 *In its* Translations from Voprosy Psikhologii (Problems of Psychology) Nov. 29, 1962 p 27-44 (See N63-11593 04-14) OTS: $8.10

A study is made of the efficiency of operation of a "man-automatic machine" system made up of the following basic factors: (1) perfection of technical equipment, its productive possibilities; (2) individual characteristics and the degree of training of the human operator; and (3) mutual adaptation of man and machine as factors in a single comprehensive control system. J.R.C.

N63-11595 Joint Publications Research Service, Washington, D.C.

STUDY OF THE ROLE OF THE PERSONAL FACTOR IN THE CONTROL OF POWER PLANT ELECTRICAL EQUIPMENT (ON THE PSYCHOLOGICAL MANIFESTATIONS OF THE BASIC PROPERTIES OF THE HUMAN NERVOUS SYSTEMS IN WORK ACTIVITY)

K. M. Gurevich and S. S. Gadzhiyev Transl. from Voprosy Psikhologii (Moscow), no. 3, 1962 p 37-44 *In its* Translations from Voprosy Psikhologii (Problems of Psychology) Nov. 29, 1962 p 45-54 5 refs (See N63-11593 04-14) OTS: $8.10

A study is made of the psychological manisfestations of the human nervous system under active work conditions. It is noted that under conditions of difficult and strenuous activity, people behave differently. Experience shows that confusion, in its various manifestations, is generally the result of the effects of strong and sudden stimuli on people with weak nervous systems. Neither nervous system weakness nor strength, in itself, is a poor or good individual characteristic. J.R.C.

N63-11596 Joint Publications Research Service, Washington, D.C.

SOME TRENDS IN THE STUDY OF "MAN-MACHINE" SYSTEMS IN THE UNITED STATES

M. I. Bobneva Transl. from Voprosy Psikhologii (Moscow), no. 3, 1962 p 177-184 Material from a conf. of the western div. of the Am. Inst. of Radio Engr., August 1960 *in its* Translations from Voprosy Psikhologii (Problems of Psychology) Nov. 29, 1962 p 76-87 18 refs (See N63-11593 04-14) OTS: $8.10

This paper on "man-machine" systems covers the following: methods of analysis of man-machine systems; criteria for distribution of functions between man and machine; simulation of the man-machine system; analysis of interaction of the system components; and symbolic coding of information. J.R.C.

N63-11934 Joint Publications Research Service, Washington, D.C.

SOVIET PSYCHOLOGICAL REPORTS

V. D. Nebylitsyn et al Jan. 21, 1963 60 p 88 refs Transl. of 4 articles from Voprosy Psikhologii (Moscow), no.4, July-Aug. 1962 p 58-73, 89-98, 156-160, and 172-182
(JPRS-17219) OTS: $5.60

CONTENTS:

1. METHODS AND SYSTEMS FOR THE AUTOMATIC ANALYSIS OF BRAIN BIOPOTENTIALS V. D. Nebylitsyn (Inst. of Psychology, Acad. of Sci. RSFSR) p 1-18 76 refs
2. ENGINEERING PSYCHOLOGY AND WORK SAFETY Yaro Krzhivoglavy (Sci.-Res. Inst. of Work Safety, Prague) p 19-30 12 refs
3. PROBLEMS OF PSYCHOLOGY PRESENTED IN CYBERNETICS TO THE SERVICE OF COMMUNISM V. N. Pushkin and D. N. Zavalishina p 31-39

4. ALL UNION CONFERENCE ON PHILOSOPHICAL PROBLEMS RELATED TO THE PHYSIOLOGY OF HIGHER NERVOUS ACTIVITY AND PSYCHOLOGY A. M. Matushkin and F. A. Sokhin p 40-57

15 INSTRUMENTATION

Includes: design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gauges; and sensors and transducers.

For related information see: 06 Auxiliary Systems; 08 Communications; 09 Electronics; and 22 Navigation and Guidance.

N63-11610 Picatinny Arsenal. Ammunition Group, Dover, N.J.
DEVELOPMENT OF A TEMPERATURE STABILIZED ORDNANCE BINARY TIMER
Walter Katz and Robert Huxster Sept. 1962 35 p
(PA-TM-1017)

A program for development of a modular electronic timer is described. The timer consists of a stable inductance capacitance oscillator that feeds a chain of binary counters which can be set in 0.1-second increments up to 1,000 seconds, and is ±0.1% accurate over an operational temperature range of 165° F to -65° F. The output (capable of initiating an explosive train) is taken from the binaries by an AND gate system through a digital selector switch, and gives a single electrical output at the completion of the time cycle. Author

N63-11619 National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE USE OF AN IONIZATION GAGE AS A QUANTITATIVE ANALYZER FOR BI-GASEOUS MIXTURES
Leonard T. Melfi, Jr., and George M. Wood, Jr. Washington, NASA, Dec. 1962 12 p 4 refs
(NASA TN D-1597) OTS: $0.50

The inherent difference in the relative ionization of helium and air has been utilized as a means of quantitatively measuring the percentage composition of helium-air mixtures. The technique will find application in facilities requiring multichannel analysis of any bigaseous mixtures which have sufficient differences in relative ionization. Upon the completion of laboratory testing, the gas analyzer was successfully field tested in conjunction with a project in which mixture compositions from 0- to 100-percent helium were measured from a number of survey points in a supersonic stream. Author

N63-11623 National Bureau of Standards, Boulder, Colo.
A SURVEY OF THE TECHNIQUES FOR MEASURING THE RADIO REFRACTIVE INDEX
R. E. Mc Gavin May 1962 42 p 26 refs
(NBS-TN-99) GPO: $0.30

The radio refractive index can be measured either directly or indirectly. The former method is utilized by radiofrequency refractometers; the latter method involves measurement of temperature, pressure, and humidity, and conversion to refractive index. In terms of convenience and accuracy, the direct method is superior; however, lack of the universal use of refractometers requires the use of weather-service data for the bulk of refractive index structures. Meteorological sensing is limited mainly by the inaccuracy in measuring humidity which, under ideal conditions, appears to limit the accuracy to ±1.0 N. Gradient measurements, utilizing radiosondes, reflect an accuracy no better than ±3 N units. Radiofrequency refractometers are capable of accuracies as much as an order of magnitude better than that achieved by meteorological sensors. Lightweight refractometers have been devised for balloon-borne and dropsonde measurements, reflecting accuracies inferior to the conventional refractometer but superior to the radiosonde. Author

N63-11663 Atomic Energy Commission. Div. of Technical Information, Washington, D.C.
SCINTILLATION METHOD IN RADIOMETRY
V. O. Vyazemskii, I. I. Lomonosov, A. N. Pisarevskii, Kh. V. Protopopov, V. A. Ruzin, and E. D. Teterin Oct. 1962 421 p 645 refs
Transl. by Lydia Venters (Argonne National Lab.) of "Stsintillyatsionnyi Metod v Radiometrii" Moscow, State Publishing House for Atomic Energy and Tech. Lit., 1961
(AEC-TR-5259) OTS: $5.00

This book on scintillation method in radiometry covers the following: scintillation method in general; scintillators and scintillation process; photomultipliers and processes occurring in them; electronic devices in the scintillation method; gamma-ray spectrometry; spectrometry of charged particles; scintillation methods for recording neutrons; and some applications of the scintillation method for nuclear and nonnuclear investigations. J.R.C.

N63-11664 New York U., N.Y.
[MICROWAVE CAVITY SPECTROMETER Final Report]
Benjamin Bederson Nov. 21, 1962 3 p
(Contract AF 49(638)943)

A microwave cavity spectrometer is developed to measure the concentration of hydrogen atoms in a discharge and to determine surface recombination. The spectrometer was designed to detect the 1420 Mc/sec. transition in atomic hydrogen, corresponding essentially to the zero field hyperfine separation of the ground state. The heart of the spectrometer is the tunable brass cavity which has been incorporated as the reflection cavity in one arm of a hybrid ring bridge system. A microwave oscillator has been developed to produce a localized discharge at various points along the side arm. J.R.C.

N63-11691 Bureau of Mines. College Park Metallurgy Research Center, Md.
DESIGN, CONSTRUCTION, AND EVALUATION OF AN ELECTRON PROBE X-RAY SPECTROGRAPH
J. D. Brown, J. W. Thatcher, and W. J. Campbell 1962 35 p 18 refs
(BM-RI-6111)

Four scanning curved-crystal spectrometers, two reflection- and two transmission-type, were designed and constructed. The reflection spectrometers are placed in a vacuum chamber for measurement of long-wave-length X-radiation. Detection, pulse-amplitude discrimination, and recording circuits are provided for the simultaneous measurement of four X-ray spectral lines. In general, reflection spectrometers exhibited satisfactory but poorer resolution than the transmission type, resolution of the spectrometers being limited primarily by crystal imperfections, with greater mosaic structure being introduced by the grinding process for the reflection crystals. Several applications of the electron probe X-ray spectrograph are described. Analysis of a uranium-steel is discussed in detail to illustrate calculation of composition from measured X-ray intensities. Author

N63-11743 Texas U. Defense Research Lab., Austin
MODIFYING A DYMEC DY-5304 TIME INTERVAL RECORDING SYSTEM TO INCREASE ITS DATA HANDLING CAPABILITY
George G. Moore Dec. 1962 23 p
(Contract NOrd-16498)
(DRL-490; CF-2990)

Modification of the Dymec DY-5304 Time Interval Counting System at Station 002 to provide simultaneous reduction of two channels of Doppler data is described. Author

N63-11748 Wacline, Inc. Optron Lab., Dayton, Ohio
OPERATION AND MAINTENANCE INSTRUCTIONS OFF AXIS DOUBLE PASS SCHLIEREN SYSTEM [Final Technical Report]
M. E. Goll and T. A. Lapenas Wright-Patterson AFB, Ohio, Aeronautical Research Labs., Nov. 1962 20 p
(Contract AF 33(616)-8427)
(ARL-62-463)

General arrangement of the Schlieren system and its components is briefly described. Optical and electrical elements are diagrammatically shown. Steps necessary for initial alignment and operation are described. Author

N63-11775 Aro, Inc., Arnold Air Force Station, Tenn.
SOLAR SIMULATION INSTRUMENTATION
Charles F. Norman Arnold Engineering Development Center, Jan. 1963 41 p 6 refs Presented at the Summer General Meeting of the AIEE, Denver, June 1962
(Contract AF 40(600)-1000)
(AEDC-TDR-62-191)

The most important instrumentation and control devices required to operate, maintain, align, and measure the output of the Mark I solar simulator are described. The definition and simulation of the more significant sources of electromagnetic radiation in a space environment, i.e., insolation, albedo, and earth radiance, are discussed. Author

N63-11803 Stanford Research Inst., Menlo Park, Calif.
DEVELOPMENT OF X-RAY FLUORESCENCE ANALYSIS TECHNIQUES FOR SMALL SAMPLES: A PROTOTYPE ATMOSPHERIC ELECTRON PROBE Final Report
T. O. Passell, J. B. Swedlund, and S. I. Taimuty Oct. 31, 1962 77 p 25 refs
(Contract AF 19(604)-8827)
(AFCRL-62-933)

The chromium content of a ruby was determined at the concentration level of 0.03 mole percent (Cr_2O_3 in Al_2O_3) with a net signal-to-background ratio of 5. The volume resolution was approximately 1 mm^3. This was accomplished with a standard Norelco goniometer and X-ray tube with a lithium fluoride (LiF) analyzer crystal, curved to obey Rowland circle focusing conditions for Cr Ka, a helium X-ray path within the spectrometer, and a NaI (Tl) scintillation detector. A prototype atmospheric electron probe was built and tested for use in exciting fluorescent X-rays. Both conducting and insulating solids can be readily analyzed at atmospheric pressure with this probe. A relatively crude feasibility test on a pure nickel specimen gave 380 counts/sec. at the Ni Ka peak from a 15 μamp primary electron beam at 25-kev initial energy. Author

N63-11853 Bell Helicopter Co., Fort Worth, Tex.
EXPERIMENTAL EVALUATION OF AN EIGHT-INCH CRT CONTACT ANALOG PRESENTATION Technical Report
W. E. Feddersen May 1962 26 p 10 refs
(Contract Nonr-1670(00))
(D228-421-011)

This report is a summary of the work undertaken to determine the effect upon performance of a change in geometric perspective of ground plane information as introduced by a reduction in the physical size of a contact analog display. This study was necessitated by the introduction of a 'compression' factor which is associated with a reduction in display size when achieved with projection or closed circuit TV systems. Since this compression factor represents a departure from real-world coincidence, it was necessary to determine its effect upon hovering performance when compared with the Autonetics display in which the compression factor was not present. The results indicate that the differences in performance on the two displays were not significant and that rather gross changes could be made in ground plane perspective without affecting performance. Although the limits of such allowable changes have not been established, it would appear that as long as the perceptual relationship between the generated ground plane and the earth's surface is analogous then the limits of such changes might be quite broad. It should be emphasized that this generalization does not take into account the performance changes that might be associated with display enrichment (i.e., pathway, director symbols, etc.) and other flight modes. Author

N63-11860 Air Force Cambridge Research Labs. Geophysics Research Directorate, Bedford, Mass.
A SONIC ANEMOMETER FOR THE STUDY OF TURBULENT WIND LOADING ON MISSILES
J. Chandran Kaimal Oct. 1962 15 p 4 refs
(AFCRL-62-1064)

The design of a sonic-wind-component meter particularly suited for the study of turbulent wind loading on a stationary missile is described. The instrument measures eddy fluctuations in the wind along two horizontal axes with an array consisting of one emitter and four receivers. Careful analysis of possible errors shows that measurements should be accurate to within 5 percent. Author

N63-11877 Bendix Corp. Research Labs. Div., Southfield, Mich.
DEVELOPMENT OF A DEWPOINT HYGROMETER FOR ATMOSPHERIC SOUNDING
H. R. Farrah, A. A. Vitale, and H. R. Young June 1962 119 p 5 refs
(Contract AF 33(600)-41821)
(Bendix RLD-2055)

This report describes the development of a thermoelectric-cooled, mirror-type dewpoint hygrometer for use in measuring dewpoint in the range of –80° C to + 50° C in altitudes between 100 K feet and sea level. The hygrometer operates on the principle that when the water vapor pressure directly over a dew or frost film is in equilibrium with the partial pressure of water in the sample passing over a mirror surface, the temperature of the dew or frost film is the dewpoint temperature of the sample. Under equilibrium conditions, the dew or frost film on the mirror has a constant thickness. The hygrometer, by photodetecting the film thickness and thermoelectrically controlling the mirror temperature, maintains the film at a constant thickness. The mirror temperature under these conditions is at the required dewpoint temperature. This instrument can be adapted for balloonsonde or rocketsonde use. It is small, reliable, has simple sampling requirements, and shows promise of being produced economically. This report describes all the aspects of development, design, and laboratory and environmental tests. Author

N63-11923 Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
FLOW VISUALIZATION AND QUANTITATIVE GAS DENSITY MEASUREMENTS IN RAREFIED GAS FLOWS [Final] Technical Documentary Report [March 1, 1961-June 1962]
Robert C. Mac Arthur, Leroy M. Stevenson, and John Budell Wright-Patterson AFB, Ohio, Directorate of Engineering Test, Dec. 1962 42 p 14 refs
(Contract AF 33(616)-8145)
(ASD-TDR-62-793)

The use of an electron beam to stimulate emission from a gas with the resultant beam intensity providing a measure of point-by-point gas density, has been investigated. The tests have been conducted in the 1- to 200-micron pressure range, at standard temperature, employing a 5- to 20-kev electron beam. Analysis was

performed by photographing the beam at conditions of varying density, and examining the film by means of a microdensitometer. A low-cost electron gun capable of projecting a 20-kev, 500-microampere beam across a 24-inch test chamber was successfully developed. The results of the program indicate that at the beam voltages employed, scattering of the electrons by the atoms of the gas severely limits the particular technique used. The analytical and experimental results of the program indicate that gas density measurement and flow visualization may be possible by employing a more energetic electron beam. By observation of the beam-excited emission spectra, it is possible to measure the rotational and vibrational temperature of the nitrogen molecules as well as the number density of nitrogen molecules in the gas. Further investigation of this latter electron beam technique as a diagnostic technique in hypervelocity flows is recommended. Author

16 LIFE SCIENCES

Includes: biology; exobiology; physiology; medicine; life support systems; radiation effects on biological systems; and space sickness.

For related information see: 14 Human Behavior; and 28 Space Radiation.

N63-11561 Joint Publications Research Service, Washington, D.C.
CHANGE IN THE CONTENT OF BIOLOGICALLY ACTIVE SUBSTANCES IN RATS FOLLOWING THE ACTION OF RADIAL ACCELERATIONS
I. M. Khazen and I. L. Vaysfel'd Jan. 3, 1962 11 p 30 refs
Transl. from Voprosy Med. Khom. (Moscow), v. 8, no. 5, Sept.-Oct. 1962 p 493-497 *In its* Translations from Voprosy Meditsinskoy Khimii (Problems of Medical Chemistry), p 1-9
(JPRS-16956) OTS: $3.60

A study is made of the changes in the content of adrenalin, acetylcholine, histamine, and serotonin in rats subjected to radial accelerations. In rats, following single positive radial accelerations, the histamine content increases in the intestinal mucosa and decreases considerably in the lungs and brain tissues. The diaminoxidase activity rises in the investigated tissues, especially in the lungs and cerebral tissue. Following single negative accelerations, the histamine content and diaminoxidase activity decreases in the tissues. The content of adrenalin-like substances decreases in the intestinal mucosa and brain tissues. With multiple and frequently repeated positive accelerations, the examined tissues also show a reduction of the content of histamine and of adrenalin-like substances in the intestinal mucosa and brain tissues. Under similar experimental conditions, the excretion of 5-hydroxyindole acetic acid with the urine decreases. The changes in the excretion of this acid are also directly correlated with the intensity, frequency, and duration of the radial acceleration. J.R.C.

N63-11608 Nagoya U. Research Inst. of Environmental Medicine (Japan)
ANNUAL REPORT, 1961
1962 33 p 33 refs In Japanese
CONTENTS:
1. ANNUAL REVIEW OF PROGRESS IN THE AERO-MEDICAL DEPARTMENT Fushiro Motobayashi p 1-2
2. PRELIMINARY STUDY ON THE BIOLOGICAL PHENOMENA IN ROCKET FLIGHT Shigeru Ando and Sadaharu Takagi p 2-4
3. HOW IS THE MENTO-PHYSICAL CONDITION MEASURED? (1. PRELIMINARY STUDY) Fushiro Motobayashi, Sukeo Sugimoto, Tamotsu Somiya, and Sadaharu Takagi p 5-12
4. NEUROGLIAL RESPONSE AND A THEORY OF NEUROGLIALNEURONAL INTERACTION Genyo Mitarai p 12-17
5. ADIENT REACTION POTENTIAL AND ABIENT REACTION POTENTIAL AS A FUNCTION OF THE FISTANCE (FROM THE OBJECT (3)) Tamotsu Somiya p 17-21
6. EXPERIMENTAL AND THEORETICAL STUDIES ON BEHAVIOR IN SPACE Tamotsu Somiya p 21-31

N63-11624 Aerospace Medical Div. School of Aerospace Medicine, Brooks AFB, Tex.
STRESS IN DENTAL PATIENTS: SERUM AND URINE 17-HYDROXYCORTICOSTEROID RESPONSES IN IMPACTION PATIENTS
Ira L. Shannon, Lucian Szmyd, and John R. Prigmore Apr. 1962
7 p 25 refs
(SAM-62-59)

A total of 91 impacted lower third molars was removed and patient adrenocortical response, both before and after surgery, was measured. Both serum free and urine total 17-hydroxycorticosteroids were determined in these patients and in 33 control subjects. The preoperative serum mean of 20.68 gamma percent for the surgery patients was significantly higher than that of 14.17 gamma percent found for the controls. It was also significantly higher than the 13.74 gamma percent found for our 633 laboratory control subjects and the 17.53 gamma percent for 286 subjects scheduled for simple exodontia. One hour after operation, the effect of anticipating and experiencing impaction surgery was no longer evident. Urinary excretion of corticosteroids was not significantly different for the impaction and control groups. Author

N63-11628 Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.
COUNTDOWN AND PROCEDURES FOR PROJECT MERCURY ATLAS-5 FLIGHT (CHIMPANZEE SUBJECT) [Final] Technical Documentary Report
Norman E. Stingely Oct. 1962 95 p 1 ref
(ARL-TDR-62-17)

The 6571st Aeromedical Research Laboratory participation in Project Mercury had the following objectives: (1) to develop methods, techniques, and procedures for determining the biomedical adequacy of the Project Mercury manned capsule; (2) to study chimpanzee physiology, biochemistry and psychomotor performance prior to, during, and after flight; and (3) to obtain a dynamic validation of ground, flight, and recovery procedures. This report presents the countdown and detailed procedures followed to prepare the chimpanzee subject and couch for flight in the Project Mercury capsule and the postflight release and care of the subject in order to accomplish the above objectives. It summarizes experiences gained during the Mercury Redstone-2 and the Mercury Atlas-5 flight programs. Author

N63-11683 Joint Publications Research Service, Washington, D.C.
DETERMINATION OF THE SPECTRAL SENSITIVITY OF RETINA RECEIVERS IN EXPERIMENTS WITH DICHROMATES
N. V. Lobanova and G. N. Rautian Jan. 9, 1963 11 p 14 refs
Transl. from Doklady Akad. Nauk SSSR (Moscow), v. 146, no. 5, 1962 p 1193-1196
(JPRS-17054) OTS: $1.10

The purpose of the work described was to study the color vision in a 10° portion of the retina which is at present accorded preference in colorimetry. The subjects studied were dichromates, some of the deuteranopic type and some of the protanopic type. The subjects who set the colorimeter adjustments for various color filters were trichromates (people with normal color vision). After the colorimeter

settings for the five color filters used had been set up by the trichromates with normal vision, the dichromate subjects were required to adjust the colorimeter for each color, using the filters, and these settings were recorded and plotted. From these experimental settings it was possible to convert physiological coordinates to the X, Y, and Z coordinates of the Stiles-Speranskaya system and back again by use of developed equations. The information derived for the protanopic and deuteranopic subjects was tabulated and curves were plotted. A.S.

N63-11684 Joint Publications Research Service, Washington, D.C.

BIONICS AND CETACEANS

A. G. Tomilin Jan. 10, 1963 7 p Transl. from Priroda (Moscow), no. 10, 1962 p 101-103
(JPRS-17079) OTS: $1.10

A new method of hunting whales and dolphins is described. The cetaceans are lured to whaling ships and fishing equipment by playing previously recorded signals for help, sounded by weak or sick animals threatened by drowning. Cetacean echolocation apparatus, which permits orientation under water at different distances, is discussed. A study of skin structure and swimming speed indicates that bionics may find ways of designing hulls for ships which would increase their speed considerably. I.v.L.

N63-11686 Isomet Corp., Palisades Park, N.J.

DESIGN AND DEVELOPMENT OF REGENERATIVE CARBON DIOXIDE SORBERS [Final] Technical Documentary Report [March 1, 1961-February 28, 1962]

Horace W. Chandler, Eugene Mc Donald, Frank Z. Pollara, and George Walden Wright-Patterson AFB, Ohio, Life Support Systems Lab., Nov. 1962 49 p 7 refs
(Contract AF 33(616)-7909)
(AMRL-TDR-62-135) OTS: $1.25

On the basis of a survey the two most potentially valuable regenerable carbon-dioxide sorption systems, molecular sieves and silver oxide preparations, were selected for laboratory investigation. The 5A molecular sieve removed carbon dioxide from air containing 1 volume percent carbon dioxide, provided that water vapor was first removed from the air. At a flow rate of 500 cc/min. of this air through a 1-inch diameter column containing 100 grams of 5A molecular sieve, the bed picked up about 3 grams of carbon dioxide before carbon dioxide was detectable in the column effluent. Under identical operating conditions, a 100-gram bed containing a silver-oxide preparation picked up about 8 or 9 grams of carbon dioxide. Water vapor in the air is necessary for efficient utilization of the silver oxide. Both the 5A molecular sieve and the silver-oxide preparation are regenerable, but regeneration of the silver oxide occurs at a lower temperature. Author

N63-11713 Geological Survey, Washington, D.C.

AERORADIOACTIVITY SURVEY AND RELATED SURFACE GEOLOGY OF PARTS OF THE LOS ANGELES REGION, CALIFORNIA (ARMS-1)

Kenneth G. Books Washington, AEC Div. of Biology and Medicine, Dec. 20, 1962 24 p 27 refs
(Rept. CEX-59.4.16) OTS: $0.75

An airborne gamma-radiation survey in the region of Los Angeles, California, shows a moderate range in the levels of natural radioactivity. The lower levels can be related to lowland alluvium, and the higher levels can be related to consolidated rocks. The highest radioactivity is associated with granitic intrusions and Tertiary volcanic rocks. The survey covered about 2800 square miles. Continuous radioactivity profiles were obtained with scintillation counting equipment, at approximately 500 ft. above the ground on parallel north-south flight lines spaced 1 mile apart. A map of aeroradioactivity levels was prepared from the profiles. Author

N63-11716 Joint Publications Research Service, Washington, D.C.

PREVENTION MEASURES FOR RADIATION SAFETY

N. Yu. Tarasenko, I. G. Prostakova, and N. N. Rynkova July 13, 1962 37 p Transl. from "Work Hygiene in Working in Atomic Electrical Stations" Moscow, 1960 p 58-103
(JPRS-14449) Distributed by OTS

Radiation safety measures in atomic electrical stations must include both standard measures for biological protection against penetrating radiation and special considerations for containing the radiation in the event of an accident. Biological protection measures including shielding, ventilation, personal hygiene routines, special clothing, and decontamination procedures are examined. The importance of protective jackets for the reactor, sanitation protective zones, building layout, and organization of the technical processes is emphasized in planning an atomic electrical station to minimize the hazards of a reactor accident. M.P.G.

N63-11720 Atomic Energy Commission. Div. of Technical Information, Washington, D.C.

PROBLEMS OF RADIATION GENETICS

N. P. Dubinin Nov. 1962 526 p 886 refs Transl. by JPRS of "Problemy Radiatsionnoi Genetiki" Moscow, State Publishing House for Atomic Energy and Tech. Lit., 1961
(AEC-TR-5376) OTS: $6.00

This book on radiation genetics covers the following: structural, physical, and chemical bases of heredity; the physical nature of the biological action of radiation; the effect of ionizing radiation on heredity of animals, plants, microorganisms and viruses; the action of ultraviolet rays on heredity of plants, animals, microorganisms and viruses; radiogenetic effect of visible light; radiation genetics of mammals; ionizing radiation and human heredity; and radiation selection of planets and microorganisms. J.R.C.

N63-11740 National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.

DEVELOPMENT OF INFLATABLE COMPONENTS OF PERSONAL EQUIPMENT FOR ASTRONAUT BODY INSTRUMENTATION AND SURVIVAL AT SEA

Matthew I. Radnofsky and Joseph J. Kosmo Washington, NASA, Jan. 1963 37 p 6 refs
(NASA TN D-1083) OTS: $1.00

Five inflatable components were designed, developed, and fabricated for use in the Mercury spacecraft. The items developed were a blood-pressure cuff, lifevest, liferaft, water container, and a radar reflector. Each item is discussed fully in this paper. Also discussed are the fabrication procedures used for these items. Author

N63-11755 North Carolina U. School of Medicine, Chapel Hill

THE VENTILATORY RESPONSE TO CARBON DIOXIDE AND TO OXYGEN AFTER ACCLIMATIZATION TO CARBON DIOXIDE [Final] Technical Documentary Report [Feb. 1960-May 1962]

Thomas B. Barnett and Richard M. Peters Wright-Patterson AFB, Ohio, Biomedical Lab., Nov. 1962 18 p 6 refs
(Contract AF 33(616)-6261)
(AMRL-TDR-62-136)

A chamber has been designed so that dogs can be exposed for prolonged periods to abnormal atmospheres. The concentrations of CO_2 and O_2 are continuously controlled and recorded. Exposure of dogs to approximately 3 percent CO_2 in air for 6 days or more

resulted in a decrease in the ventilatory response to CO_2. In control dogs, the breathing of 50 percent oxygen for 30 minutes was associated with a slight-to-moderate increase in ventilation without a significant change in arterial pCO_2. After acclimatization to CO_2, oxygen breathing was associated with little change in ventilation but with a rise in arterial pCO_2. Author

N63-11772 Flying Personnel Research Committee (Gt. Brit.)
FACTORS CONTROLLING THE CHOICE OF THE METERED OXYGEN FLOW AND THE CAPACITY OF THE RESERVOIR IN PRESSURE ECONOMISER SYSTEMS
J. Ernsting (Inst. Aviation Med., RAF) Air Ministry, Feb. 1962 25 p 15 refs
(FPRC/Memo-176)

The mode of operation of the pressure economizer system has been reviewed, and the factors which affect the choice of the metered oxygen flow and the capacity of the reservoir have been described. The physiological requirements, with regard to the concentration of oxygen which should be delivered to the respiratory track in relation to altitude, have been reviewed. Two requirements are proposed, one for a low-differential cabin and the other for aircraft with a high-differential pressure cabin. The evidence available with regard to the maximum pulmonary ventilation likely to occur in seated aircrew has been examined. It is considered that this value is of the order of 25 l/min. B.T.P.S., and that it will not exceed 30 l/min. B.T.P.S. The mass flow of oxygen necessary to maintain the physiological requirements at a pulmonary ventilation of up to 25 l/min. B.T.P.S. has been calculated. It is proposed that in an intact pressure cabin the oxygen flow supplied in the pressure economizer should be 4.0 l/min. N.T.P. at cabin altitudes of up to 28,000 ft. Above 28,000 ft. the system should supply 100% oxygen on demand. The minimum volume of the pressure reservoir required in a system which employs the flow specified and a reduced pressure of 50 lb/sq. in. gauge is 85 ml, provided that the reservoir is emptied effectively during inspiration. Author

N63-11773 Flying Personnel Research Committee (Gt. Brit.)
PHYSIOLOGICAL ASSESSMENT OF THE ROBERTSHAW-FULTON REGULATOR TYPE 20004
E. P. Beck, J. Ernsting, and C. Lythgoe Air Ministry, Sept. 1962 22 p 11 refs
(FRC/Memo-175)

The behavior of a single sample of the R-F miniature regulator type 20004 has been determined. The resistance to breathing imposed by this regulator is slightly less than that imposed by current R.A.F. pressure-demand equipment. It appears that the regulator will meet the inflation requirements for R.A.F. partial-pressure equipment. The manner in which the regulator fails to meet current R.A.F. requirements for oxygen equipment has been discussed. It is considered that these deficiencies can be overcome by relatively simple changes, the majority of which do not involve the modification of the regulator itself. Author

N63-11776 Joint Publications Research Service, Washington, D.C.
NEW LINES OF DEVELOPMENT IN PHYSIOLOGY AND THEIR RELATION TO CYBERNETICS
N. A. Bernshteyn Jan. 14, 1963 16 p Transl. from Voprosy Filosofii (Moscow), no. 8, 1962 p 78-87
(JPRS-17117) OTS: $1.60

The emergence and development of new forms of productive activity has led both to new lines of physiological development and to problems of labor organization which are dealt with by scientific cybernetics. The continual lowering of the proportion of manual labor to intellectualized labor is seen to actively affect the locomotive functions whose physiological development is considered to be programed for an eventual realization of the desired future morphology. This model is coded into the organism, and successive generations show a tendency to develop a morphology more closely resembling the future prototype and a tendency to actively overcome obstacles to the realization of this morphogenetic program. M.P.G.

N63-11778 Joint Publications Research Service, Washington, D.C.
LATE CHANGES IN THE OSSEOUS SYSTEM OF DOGS IN RADIOACTIVE STRONTIUM AFFECTION
N. N. Litvinov Jan. 16, 1963 9 p 15 refs Transl from Arkh. Patol. (Moscow), no. 2, 1962 p 23-28
(JPRS-17161) OTS: $1.00

A study is made of the effect of strontium-90 in the osseous system of dogs. The most important and characteristic feature of skeletal changes is the impairment of the processes of osteogenesis. The changes in the processes of osteogenesis should be regarded primarily as disturbances in regeneration of the bone. As a result of the impairment of the osteogenetic process, typical osseous structures are formed which include the following: osteogenic cellular-fibrous tissue, osteoid, coarsely fibrous bone, calcified collagen, albumin-calcium masses, and amorphous albumin. The impairment of the reorganization (resorption and new growth) of osseous tissue is manifested in the altered rhythm of bone reorganization and in the impairment of normal correlations between the processes of resorption and apposition of the bone. In their characteristics these changes of the osseous system in Sr-90 affection are most closely analogous to diseases of the osseous system such as: deforming ostosis (Paget's disease), fibrous osteodysplasia, and parathyroid osteodystrophy. J.R.C.

N63-11787 Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio
A PRELIMINARY STUDY OF THE SERVO PROPERTIES OF THE GASTROCNEMIUS MUSCLE OF THE CAT [Final Report Covering Research up to July 1961]
Lothar O. Hoeft and Virgil E. Sackschewsky Nov. 1962 22 p 2 refs
(AMRL-TDR-62-108) OTS: $0.75

A variable impedance muscle stimulator has been developed for use in investigating the control functions of biological servomechanisms. Preliminary investigations have been concerned with the properties of the gastrocnemius-muscle reflex of the cat, which represents a simple servosystem. These investigations have shown that the muscle reflex seems to be dependent, for the most part, on only a few parameters: resting tension, amplitude of the stimulus, and rate of onset of the stimulus. This type of study is useful to systems design engineers, because biological servomechanisms offer an infinite number of prototypes that can be investigated to find out how to build accurate, reliable servomechanisms able to maintain their control function while operating in a wide range of loads. Author

N63-11788 Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio
AN ANALYSIS OF THE BEHAVIOR OF LONG TETHERLINES IN SPACE [Final] Technical Documentary Report [Apr.-July 1962]
Donald D. Mueller Nov. 1962 17 p 4 refs
(AMRL-TDR-62-123) OTS: $0.50

To determine the feasibility of using long tetherlines to aid in orbital docking, or to recover astronauts operating outside a vehicle, an analysis was made of the behavior of an inert mass on the end of a tetherline as it is reeled in toward a more massive vehicle. Only coplanar motions were considered. Three methods of reeling the mass in toward the vehicle were analyzed: impulsive jerks on a slack tetherline, constant line tension, and constant reel-in speed. The first two methods result in complex paths which intersect the vehicle only after long periods of time. The third method results in a spiral path in which both the velocity and centripetal acceleration of the mass approach infinity as the line length approaches zero. Since

angular momentum of the mass around the vehicle is very nearly conserved, the magnitude of the retrieval problem depends primarily on the initial length of the tetherline and the initial tangential velocity of the mass. Reeling in a line a few hundred feet in length can result in forces which would be intolerable to an astronaut. Author

N63-11790 Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.

CHIMPANZEE PERFORMANCE DURING A SIMULATED THREE-DAY SPACE FLIGHT

Donald N. Farrer and Victor Bogo Dec. 1962 34 p 7 refs
(ARL-TDR-62-25)

Chimpanzee performance during a simulated 97-hour space-flight profile environment was evaluated with a pilot study and a crossover design. The response rate on the continuous avoidance task was significantly lower for one subject in the 100-percent O_2 environment, and both subjects performed at lower rates during night work sessions on all tests. There was no evidence of reaction time decrement for any subject on the discrete avoidance task. Food and water consumption was poor during the simulated space flight, but a chimpanzee could withstand a 97-hour flight-profile environment of 100-percent O_2 at 14.7 psi for 15 hours followed by 100-percent O_2 at 5 psi for 82 hours, without serious performance changes. Author

N63-11791 Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.

THE NATURE OF REFLEX BRISKNESS

Ellis R. Taylor and Leroy W. Rhein Dec. 1962 13 p 4 refs
(ARL-TDR-62-27)

An accelerometer sensor was used in the testing of patellar and other deep-tendon reflexes. A qualitative difference was noted in the time-history and waveform produced by patients with the dinical picture of "increased briskness" due to well-demonstrated upper-motor neuron pathology. The "brisk" reflex achieves maximum force in the same time as normal, but maintains this force at approximately the same level for .04 to .10 seconds; at this time damping occurs quickly. In contrast, normal subjects exhibit damping instantaneously after reaching peak acceleration. Thus the phenomenon of briskness is a prolongation of peak acceleration, hence of peak force. Author

N63-11792 Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.

A PROPOSED APPROACH TOWARD DETERMINING THE PSYCHOPHYSIOLOGICAL EFFECTS OF PROLONGED MANNED SPACE FLIGHT

Frederick H. Rohles, Jr., and Herbert H. Reynolds Dec. 1962 9 p 1 ref
(ARL-TDR-62-28)

Orbital space flights are proposed to study the psychophysiological effects of prolonged weightlessness and cosmic radiation. The program presented will use animal subjects, and attempts to eliminate weightlessness and cosmic radiation as deterrents to manned space flights of higher altitudes and longer duration. Author

N63-11793 Aerospace Medical Div., Aeromedical Research Lab. (6571st), Holloman AFB, N. Mex.

THROMBOCYTOPENIA FOLLOWING ABRUPT DECELERATION. A Preliminary Communication

Ellis R. Taylor Dec. 1962 17 p 12 refs
(ARL-TDR-62-30)

A series of 6, progressively severe, abrupt acceleration tests were conducted on 7 human sled-subjects in the forward facing position, with the final 2 impacts on each subject being $-20G_x$ peak, at an onset rate of 800 G/sec. Thrombocyte counts made before, 1 hour after, and 24 hours after impact revealed a 1-hour postimpact decrease of major proportion, with full recovery to mean preimpact thrombocyte concentrations by 24 hours postimpact. An elevation of preimpact (baseline) thrombocyte counts occurred after the first and fifth tests. Various mechanisms for this effect are presented, and areas of potential use are outlined. Author

N63-11822 Atomic Energy Commission. Div. of Technical Information, Washington, D.C.

RADIOBIOLOGY

A. M. Kuzin, ed. Dec. 1962 251 p refs Transl. by JPRS from "Radiobiologiya" (Moscow), v. 1, no. 6, 1961 Publ. House of the Acad. of Sci. USSR, 1961
(AEC-TR-5427) OTS: $3.50

A series of articles from the Soviet periodical, *Radiobiology*, are presented as a review of fundamental research in radiobiology and its practical applications. The papers presented deal with the nature and biomechanisms of ionizing radiation, radiation protection, radiation genetics, and the biological relationships of small doses of radiation and prolonged exposure to radiation. These studies have importance in safeguarding human space travel and in the application of ionizing radiation to clinical medicine and agriculture. M.P.G.

N63-11824 Atomic Energy Commission. Div. of Technical Information, Washington, D.C.

ACCUMULATION OF RADIOACTIVE ELEMENTS IN THE BODY AND THEIR EXCRETION

V. S. Balabukha and G. Ye. Fradkin Oct. 1962 170 p 180 refs Transl. by JPRS of "Nakoplenie Radioaktivnykh Elementov v Organizme i ikh Vyvedenie" Moscow, State Publishing House of Medical Literature, 1958
(AEC-TR-5236) OTS: $2.75

The general regularities which determine the specific nature of the metabolism of radioactive isotopes of alkaline earths, rare earths, and heavy elements are discussed; and the data relating to the behavior within the organism of individual osteotropic radioisotopes are presented. D.B.

N63-11834 Aerospace Information Div., Library of Congress, Washington, D.C.

METHODS OF FIXING EKG ELECTRODES FOR SPACE FLIGHTS

Dec. 19, 1962 4 p Review of: M.A. Agadzhanyan, I. T. Akulinichev, K. P. Zazikin, and D. G. Maksimov Method of fixing electrodes for EKG recording during manned space flights Problemy kosmicheskoy biologii, (Moscow), v. 1, 1962 p 451-459
(AID-62-200) OTS: $1.10 ph, $0.80 mf

Two methods of attaching electrodes, either by means of pieces of gauze saturated with various adhesive substances or by means of a strap harness, were tested. Both methods are feasible for space-flights up to 13 days; however, the strap method was recommended for prolonged spaceflights because it was more comfortable, more reliable, and less irritating to the skin. I.v.L.

N63-11835 Aerospace Information Div., Library of Congress, Washington, D.C.

METHODS AND TECHNIQUES OF BIOMEDICAL CONTROL IN SPACE FLIGHT

Dec. 19, 1962 4 p Review of: N. M. Sisakyan and V. I. Yazdovskiy, eds. Pervyye kosmicheskiye polety cheloveka (First space flights of man), Moscow, Izd-vo Akad. Nauk SSSR, 1962 p 167-174
(AID-62-201) OTS: $1.10 ph, $0.80 mf

The physiological measurements performed on Vostoks I and II are described. These included electrocardiography, pneumography, and registration of pulse rate. In addition, kinetocardiography was

performed on Vostok II. The pulse rate was transmitted continuously on a frequency of 19.95 mc, and the other measurements were transmitted periodically. During reentry, all measurements were registered by means of a self-contained onboard system. R.C.M.

N63-11836 Aerospace Information Div., Library of Congress, Washington, D.C.

PHYSIOLOGICAL RESPONSES OF COSMONAUTS DURING SPACE FLIGHT

Dec. 19, 1962 5 p Review of: N. M. Sisakyan and V. I. Yazdovskiy, eds. Pervyye kosmicheskiye polety cheloveka (First space flights of man) Moscow, Izd-vo Akad. Nauk SSSR, 1962 p 176-198
(AID-62-202) OTS: $1.10 ph, $0.80 mf

Physiological responses of astronauts Yu. A. Gagarin and G. S. Titov are reviewed. Data on pulse frequency and respiration before liftoff, and during launching, orbital flight, and reentry are presented. Response to weightlessness is discussed. I.v.L.

N63-11837 Aerospace Information Div., Library of Congress, Washington, D.C.

RESULTS OF POSTFLIGHT MEDICAL EXAMINATIONS OF G. S. TITOV

Dec. 19, 1962 12 p Review of: N. M. Sisakyan and V. I. Yazdovskiy, eds. Pervyye kosmicheskiye polety cheloveka (First space flights of man) Moscow, izd-vo Akad. Nauk SSSR, 1962 p 125-153
(AID-62-204) OTS: $1.60 ph, $0.80 mf

Results of the postflight clinical examination of Cosmonaut Titov are presented. Electrocardiograms, ballistocardiograms, orthostatic examinations, respiratory function tests, urinanalyses, and electroencephalograms were conducted 9 hours after the flight and during the succeeding 10-month period. A basic stress reaction to the 25-hour 18-minute spaceflight was noted but these tests gave no evidence of any pathological changes. M.P.G.

N63-11839 Joint Publications Research Service, Washington, D.C.

RESTORATION OF VITAL FUNCTIONS DURING THE STATE OF CLINICAL DEATH CAUSED BY MECHANICAL ASPHYXIA (Experimental Study), Report 2

G. P. Prozorovskaya (Acad. Med. Sci. USSR) Jan. 16, 1963 14 p 1 ref Transl. from Sudebno-Med. Ekspertiza, Min. Zdravookhr. SSSR (Moscow), no. 4 p 16-23
(JPRS-17162) OTS: $1.60

Experiments to restore vital organic functions during clinical death produced by mechanical asphyxia are described. In these experiments, arterial pumping of blood with glucose and adrenalin, venous bloodletting, and artificial respiration were used. Cardiac massage was not applied. The subjects were 34 adult dogs. It was concluded that arterial pumping of blood, combined with venous bloodletting and artificial respiration, is effective in the treatment of terminal states induced by asphyxia, if the period of clinical death does not exceed three minutes. A.S.

N63-11840 Joint Publications Research Service, Washington, D.C.

THE EFFECT OF BIOCENSIS OF INTESTINAL MICROFLORA ON THE DEVELOPMENT OF RADIATION SICKNESS

G. G. Vasilenko and Y. Y. Nogachevskyy Jan. 17, 1963 8 p 5 refs Transl. from Mikrobiol. Zh. Akad. Nauk Ukr. SSR (Kiev), v. 24, no. 5, 1962 p 35-38
(JPRS-17170) OTS: $1.10

Irradiation studies have been made to determine the relation of autoinfection from intestinal microflora to radiation sickness. Mice with and without a latent carrier state for *salmonella* were irradiated with a 500 r dose. The course of the radiation sickness was followed by observing leukopenia in these groups and a control group which were given intraperitoneal injections of Gertner bacillus. The organs of sacrificed mice were studied for autoinfection which was found to be complete in 59% of the latent carrier group and in 25% of the noncarrier group. The degree of leukopenia was found to be greater in the irradiated group. It is concluded from this study that the presence of a latent infection aggravates the course of radiation sickness and that autoinfection following irradiation depends on the state of the biocenosis of the normal intestinal microflora. R.C.M.

N63-11841 Joint Publications Research Service, Washington, D.C.

THE SIGNIFICANCE OF PHONO-, VECTOR- AND BALLISTOCARDIOGRAPHY IN THE COMPLEX INVESTIGATION OF MITRAL LESIONS OF THE HEART

N. P. Malyshkin (2nd Moscow Med. Inst.) Jan. 17, 1963 7 p 8 refs Transl. from Kardiologiya (Moscow), v. 2, no. 5, 1962 p 69-70
(JPRS-17171) OTS: $1.10

In the precise clinical diagnosis of the character of mitral lesions, the combined use of phonocardiography, vectorcardiography and ballistocardiography offers many advantages. The results of these combined techniques for patients with predominant mitral stenosis, moderate mitral stenosis, and predominant cardiac insufficiency were analyzed. Many cases are cited in which the typical traits of mitral stenosis were masked in individual recordings, but whose diagnosis, on the basis of interdependent findings, was confirmed at autopsy. M.P.G.

N63-11844 Rochester U., N.Y.

A DEVICE FOR MEASUREMENT OF THORON IN THE BREATH

John B. Hursh and Arvin Lovaas Dec. 14, 1962 30 p 4 refs
(Contract W-7401-eng-49)
(UR-619)

A device has been developed to measure thoron in the breath of human subjects. It depends upon the adsorption of thoron on a cooled, charcoal particle covered plate which is adjacent to a ZnS-coated lucite disc seen by a 5-in. diameter photomultiplier tube. In its present form it will measure thoron referred to the patient's mouth with a sensitivity of 0.7 counts per minute per picocurie of thoron per minute with a background of less than 0.2 counts per minute. If one assumes 10 liters-per-minute ventilation rate, the system would detect thoron in concentrations of 0.1 picocuries per liter breath. The minimum level for measurement in ten minutes is a breath output of 10 picocuries per minute. It is also shown that, when used to measure Th^{228} in solution, the device has a sensitivity of 1.6 counts per minute per picocurie of Th^{228}. Author

N63-11845 Rochester U., N. Y.

THE CONSTANCY OF REPAIR RATE AND OF IRREPARABILITY DURING PROTRACTED EXPOSURE TO IONIZING RADIATION

Henry A. Blair Jan. 7, 1963 18 p 5 refs
(Contract W-7401-eng-49)
(UR-621)

Data on protracted exposure of mice to ionizing radiation at various constant daily rates are analyzed. The question of whether recovery rate per unit of injury and the irreparable component of injury per unit dose are dependent upon the rate and duration of exposure is studied. It is concluded that recovery rate does not depend on dose rate or duration of exposure. Irreparability, however, in one set of data is greater at high dose rate than at low, while in the other it is independent of dose rate. Since the latter effect is simpler, it is concluded that it is probably the more general. Author

N63-11922 California U., Los Angeles

ARM WATER LOSSES UNDER DISPARATE ARM AND BODY THERMAL CONDITIONS [Final Report, Aug. through Nov. 1961]

R. W. Allen and J. Lyman Wright-Patterson AFB, Ohio, Biomedical Lab., Nov. 1962 34 p 11 refs
(Contract AF 33(616)-6763)
(AMRL-TDR-62-131) OTS: $1.00

The relative contributions of local and peripheral control of sweating were investigated by subjecting the left arms of 2 subjects to a different environmental temperature than the rest of the body. The effect of the above conditions on the cooling power of the arm was also studied. Arm water loss was found to be a function of the temperature of the arm's environment, as well as a function of the temperature of the body's environment. Maximum arm heat loss tends to occur when arm environment temperature equals body environment temperature, though in the cases where unusually high sweat rates for high arm environmental air temperatures were exhibited the general relationship was not reliable. Also, evidence is offered in in support of the need for further experimentation in order to determine the effects of subject acclimatization and emotional sweating on the present results. Author

N63-11924 New York U., N.Y.
MICROBIOLOGICAL WASTE TREATMENT PROCESSES IN A CLOSED ECOLOGY [Final] Technical Documentary Report [January 1961-March 1962]
William T. Ingram Wright-Patterson AFB, Ohio, Biomedical Lab., Nov. 1962 192 p 110 refs
(Contract AF 33(616)-7837)
(AMRL-TDR-62-126)

Wastes treated in a closed ecological system are discussed according to the parameters affecting composition, quantity, and microorganisms expected in the wastes. Conventional waste treatment processes, activated sludge, trickling filters, and anaerobic digestion are discussed. Microbiological considerations including lists of organisms peculiar to each system and combination of systems are presented and discussed. Results of laboratory scale experiments of conventional systems receiving concentrated waste are evaluated. Using byproducts of waste treatment processes (sludge, bacterial bodies) as nutritional supplements for plants, algae, or animals in a nutrient support system for man during an extended space trip is considered. Experimental volume and power requirements are projected to those applicable under space capsule conditions. Limitations imposed on the several systems for extended space travel indicate that solids should be stored and liquids processed by other than microbiological treatment systems for space flights of less than one year. Author

N63-11933 Florida U. Engineering and Industrial Experiment Station, Gainesville
WASTE TREATMENT PROTOZOA. FLAGELLATA
Wilson T. Calaway and James B. Lackey 1962 47 p 34 refs
(Florida Eng. Ser. 3)

The morphology and taxonomy of flagellates encountered in sewage treatment facilities are presented. Microscopic techniques and sampling procedures are also included because the distribution and activity of these flagellates can be indicative of conditions in the waste treatment processes. M.P.G.

N63-11936 Atomic Energy Commission. Div. of Technical Information, Washington, D.C.
SAFETY RULES FOR WORKING WITH RADIOACTIVE MATERIALS
Boris Mekhailovich Zlobinskii Dec. 1962 359 p 29 refs Transl. by JPRS of the 2nd Supplemented Edition of "Bezopasnost rabot s radioaktivnymi" Moscow, State Sci.-Tech. Pub. House of Lit. on Ferrous and Nonferrous Metallurgy, 1961
(AEC-TR-5445) OTS: $4.50

The book treats the problems of safety techniques in the use of radioactive substances in scientific research and in industry—the biological action of ionizing radiation, the basic principles of protection, the organization of work using radioisotopes, the construction of work and auxiliary rooms, equipment for work with isotopes, protective shielding, the removal of waste products and deactivation, individual protective devices, dosimetric control, etc. The book is designed for safety technique workers, scientific and engineering-technical workers of research institutions and industrial enterprises, using radioactive substances. Author

N63-11948 Joint Publications Research Service, Washington, D.C.
STUDY OF RADIATION SICKNESS
M. Dostal, K. V. Ivanov, M. V. Zhukov, and M. G. Molchanova Jan. 21, 1963 12 p 4 refs Transl. of 2 articles from Patol. Fiziol. i Eksperim. Terapiya (Moscow), v. 6, no. 5, Sept.-Oct. 1962 p 60-63 and 74-75
(JPRS-17202) OTS: $1.60

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2. THE EFFECT OF ACCELERATIONS CREATED AT THE MOMENT OF IRRADIATION OF ANIMALS ON THE COURSE OF ACUTE RADIATION SICKNESS K. V. Ivanov, M. V. Zhukov, and M. G. Molchanova p 7-9 4 refs (See N63-11950 04-16)

N63-11949 Joint Publications Research Service, Washington, D.C.
A COMPARISON OF THE CENTRAL DEPRESSING ACTION OF MEDINAL, BARBAMIL, AND THIOPENTAL DURING ACUTE RADIATION SICKNESS IN RATS AND RABBITS
M. Dostal Transl. from Patol. Fiziol. i Eksperim. Terapiya (Moscow), v. 6, no. 5, Sept.-Oct. 1962 p 60-63 *In its* Study of Radiation Sickness Jan. 21, 1963 p 1-6 (See N63-11948 04-16) OTS: $1.60

The narcotic action of barbiturates (midinal, barbamil, thiopental) was compared in nonirradiated rats and in rats after total X-ray irradiation with a 600 r dose, and also in nonirradiated rabbits and rabbits irradiated with a 900 r dose; the barbiturate action was evaluated according to the extent of depression of unconditioned reflexes. The duration of the period which the animals remained in a forced position on their sides was the measure of this depression. The rate of manifestation of the action of all the barbiturates tested in rats increased most after irradiation. Narcotic action in rabbits varied as to the type of barbiturate used; however, the overall action was stronger in the case of the irradiated rabbits. Results indicate that the action of medicinal substances, which are broken down by the liver, is prolonged and reinforced after irradiation. I.v.L.

N63-11950 Joint Publications Research Service, Washington, D.C.
THE EFFECT OF ACCELERATIONS CREATED AT THE MOMENT OF IRRADIATION OF ANIMALS ON THE COURSE OF ACUTE RADIATION SICKNESS
K. V. Ivanov, M. V. Zhukov, and M. G. Molchanova Transl. from Patol. Fiziol. i Eksperim. Terapiya (Moscow), v. 6, no. 5, Sept.-Oct. 1962 p 74-75 *In its* Study of Radiation Sickness Jan. 21, 1963 p 7-9 4 refs (See N63-11948 04-16) OTS: $1.60

The characteristics of the general reaction of an organism to the combined action of radial accelerations, produced by rotating animals in a centrifuge and irradiation by penetrating radiations, were investigated. The experiments were performed on 44 male rats weighing 110-grams to 120 grams. Results indicated that acceleration produced at the moment of irradiation did not aggravate radiation sickness. The experimental animals died no earlier than those irradiated without rotation. I.v.L.

17 MACHINE ELEMENTS AND PROCESSES

Includes: bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; and materials fabrication, handling, and inspection.

For related information see: 06 Auxiliary Systems.

N63-11673 Aerospace Information Div., Library of Congress, Washington, D.C.

DISTRIBUTION OF ENERGY IN AN UNDERWATER SPARK DISCHARGE

June 29, 1962 4 p Review of: M. I. Vorotnikova Effect of the heat-emission rate in an underwater electric explosion on the distribution of the explosion energy Zhur. Priklad. Mekhan. i Tekhn. Fiz. (USSR), no. 2, 1962 p 110-112
(AID-62-89) OTS: $1.10 ph, $0.80 mf

A study is made of underwater sparks to determine the distribution of energy around the spark source. The shock-wave pressure from the discharge of 250 j of energy across a 20-mm gap is measured on an oscillograph. The initial pulsation of the gas bubble is photographed on a rotating disk photorecorder simultaneously with the registration of current, voltage, and pressure. It is shown that the energy of the radial motion of the water and the gas bubble is approximately 22% of the total energy released and is independent of the rate of release. R.C.M.

N63-11680 National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

METHOD FOR DESIGN OF PUMP IMPELLERS USING A HIGH-SPEED DIGITAL COMPUTER

Norbert O. Stockman and John L. Kramer Washington, NASA, Jan. 1963 36 p 9 refs
(NASA TN D-1562) OTS: $1.00

A method of designing pump impellers is derived from the equations of motion and continuity for incompressible nonviscous flow. The flow is assumed to follow a known stream surface (representing blade shape) that extends from hub to shroud. Equations are also derived for approximate blade-surface velocities and pressures. A detailed numerical procedure and block diagram are given for use on a digital computer. A numerical example that illustrates limited use of the method is presented and further uses are indicated. Author

N63-11695 Bureau of Mines. College Park Metallurgy Research Center, Md.

METHODS FOR PRODUCING ALUMINA FROM CLAY. AN EVALUATION OF FIVE HYDROCHLORIC ACID PROCESSES

Frank A. Peters, Paul W. Johnson, and Ralph C. Kirby 1962 76 p 33 refs
(BM-RI-6133)

The processes considered in this report are designed to extract alumina, as aluminum chloride, from calcined clay with 20 percent hydrochloric acid, and to remove the silica residue by filtration. Iron is removed by one of the following processes: isopropyl ether extraction, in which iron chloride is extracted before decomposing the aluminum chloride; gas precipitation, in which the aluminum chloride is precipitated with hydrogen chloride while leaving the iron chloride in solution; gas precipitation-isopropyl ether extraction, in which the aluminum chloride from precipitation is extracted with isopropyl ether, if necessary; caustic purification, in which a crude alumina is produced and then purified by a modified Bayer operation; or sinter purification, in which a crude alumina is produced and then purified by a lime-soda sinter operation. Author

N63-11729 Battelle Memorial Inst., Columbus, Ohio

STUDIES OF ON-STREAM PRODUCTION OF SHORT-LIVED INTRINSIC RADIOTRACERS FOR INDUSTRIAL PROCESS CONTROL

Peter Gluck, James L. Mc Farling, John F. Kircher, Charles W. Townley, and Duane N. Sunderman Dec. 18, 1962 57 p 14 refs
(Contract W-7405-eng-92)
(BMI-1606) OTS: $1.50

It has been demonstrated that isotopic neutron sources can be employed in the production of short-life radioactive tracers for use in industrial process control. The characteristics of polonium-beryllium neutron sources were investigated for this application. Such factors as the effects of activation-cell geometry, the use of moderators, salt concentrations, and the effective neutron fluxes were evaluated. Flow studies were performed for several elements, and activation efficiencies were determined. Guidelines were established to enable a process engineer to evaluate the feasibility of employing intrinsic-radiotracer process control. Several examples of this type of an evaluation were presented. Author

N63-11732 Aerospace Information Div., Library of Congress, Washington, D.C.

FORGING OF HEAT-RESISTANT STEEL DISKS

Dec. 20, 1962 3 p Review of: M. Ya. Dzugutov and V. P. Stepanov New method of producing disk forgings from ingots by upsetting Kuznechnoshtampovochnoye proizvodstvo, no. 10, 1962 p 10-14
(AID-62-205) OTS: $1.10 ph, $0.80 mf

A new technique for forging heat-resistant steel disks has been developed which eliminates repeated swaging and upset-forging operations. Carbon steel dummies 25 mm thick are placed between the ingot and the flat dies to reduce contact friction. The flat dies, made from steel, are preheated at 500° to 600° C and lubricated with graphite powder. The ingot is upset to a height of 50 mm to 60 mm above the required height. Final upsetting to the required size is performed without dummies. The height of the ingots was selected to achieve a reduction ratio of 3.5. Visual and ultrasonic inspection, macroanalyses and microanalyses, and short-time and stress-rupture tests show that the disks forged by this method have less pronounced barreling; approximately the same surface finish; no surface cracks; higher tensile and impact properties at room temperature; practically the same rupture life at 750° C under a stress of 30 kg/mm^2; and better anisotropy, i.e., higher properties in the radical direction. This new technique is suitable for steels and alloys of regular and low forgeability. It can be used for either individual ingots or electroslag- or vacuum-melted ingots cut into billets. I.v.L.

N63-11756 Mechanical Technology, Inc., Latham, N.Y.

ELASTOHYDRODYNAMIC LUBRICATION (Interim Report on the Experimental Phases)

P. Lewis, S. F. Murray, and F. K. Orcutt Nov. 7, 1962 32 p 4 refs
(Contract NONR 3729(00)FBM)
(MIT-62TR29)

The theoretical study of elastohydrodynamic lubrication continues and the experimental phase has been initiated. The objectives of the experimental portion are to determine the surface temperature of elements undergoing rolling and sliding contacts and to investigate the non-Newtonian lubricant properties. The techniques and apparatus being used in these experiments are described. R.C.M.

N63-11799 Eastman Kodak Co. Apparatus and Optical Div., Rochester, N.Y.

A PROGRAM TO DEVELOP A SYSTEM FOR THE INSPECTION OF SOLDERED ELECTRICAL JOINTS Final Report Covering Period March 4, 1961 through June 30, 1962

W. L. Zinke and C. Tepper Dec. 28, 1962 109 p
(Contract DA-30-069-507-ORD-3252)
(EK/ARD-ED-866)

This report on the development of a system for the inspection of soldered electrical joints covers the following: presentation of the theory; the general nature and capability of the system; a description of the procedure for inspecting soldered joints; a description of a typical apparatus needed to perform the inspection; an analysis of the system's advantages and disadvantages; and a review of the pertinent laboratory data which support the reliability of the system. J.R.C.

N63-11812 Ames Lab., Iowa State U. of Science and Tech.

A DIAPHRAGM PUMP FOR LIQUID METALSSERVICE

D. E. Westerheide, J. C. Clifford, and George Burnet Oct. 1962 17 p 12 refs
(Contract W-7405-eng-82)
(IS-464) OTS: $0.50

The use of centrifugal and electromagnetic pumps for liquid metals is briefly reviewed. Details are provided on the construction and operation of a two-stage diaphragm pump, successfully used for the first time in liquid metal service. From the results of a 5,376 hr. test of the pump, it was concluded that it is well suited to the pumping of liquid metals at low flow rates where pulsating flow can be tolerated. Operating temperatures and pressures are limited only by the availability of suitable materials of construction. Author

N63-11821 Armour Research Foundation, Chicago, Ill.

RESEARCH ON NEUTRON INTERACTIONS IN MATTER AS RELATED TO IMAGE FORMATION Final Report [Apr. 5, 1960-June 30, 1962]

H. V. Watts Aug. 22, 1962 97 p 23 refs
(Contract AT(11-1)-578)
(ARF-1164-27) OTS: $2.25

Thermal neutron radiography is considered and several examples of the contrast differences between thermal neutron radiography and x-radiography are illustrated. It is pointed out, however, that for certain applications resonance neutron absorption may have use, provided suitable neutron sources and detectors are used. There are several thermal neutron imaging detectors which are readily available for practical neutron radiography. The image resolution, the thermal neutron response, and the gamma-ray response of various typical neutron detectors have been determined to provide a guide for the optimum choice of detector when the parameters of a specific radiographic problem are known. Author

N63-11829 Bettis Atomic Power Lab., Westinghouse Electric Corp., Pittsburgh, Pa.

ANALYSIS OF CHECK VALVE DISC MOTION DURING A FLOW TRANSIENT

G. M. Fuls Dec. 1962 45 p
(Contract NObs 78844)
(WAPD-TM-323) OTS: $1.00

An analysis is presented of the dynamics of a check-valve disc under the influence of a flow transient. The developed equations have been programed for the Philco-2000 digital computer in FORTRAN as the SLAM Code. The code input consists of the characteristics of the valve and the flow transient. The output of the code includes the dynamics of the valve disc as a function of time and the pressure surge induced by valve closure. Author

N63-11847 Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho

EOCR CONTROL ROD AND DRIVER FUEL HYDRAULIC TESTS

L. J. Harrison AEC National Reactor Testing Station, Oct. 19, 1962 106 p 1 ref
(Contract AT(10-1)-205)
(IDO-16811) OTS: $2.25

The EOCR prototype control rod, control rod drive, and driver fuel assembly were extensively tested in 500° F Santowax and 132° F water. These tests not only established the operating characteristics of these assemblies but also revealed a number of deficiencies in the various components. The modifications required were tested to establish the satisfactory performance of the modified components. Descriptions are given of the control rod, control rod drive, and driver fuel assembly, and of their method of operation. Author

N63-11906 Industrial Science and Technology Agency. Electrotechnical Lab., Tokyo (Japan)

STUDIES UPON THE WELDING ARC

Masayoshi Ozawa June 1962 119 p 104 refs In Japanese; English summary
(Its Researches No. 630)

The electrode phenomena of welding arc is discussed. First of all, it is mentioned that the melting of electrode is applied for in the technical field, while a few points in welding arc character different from the other arcs are indicated. Secondly, the characteristics of vaporization of electrode and its heat quantity are measured, which supply the important data for the estimation of arc energy given to electrode. The phenomena of arc space after its extinction are discussed, which is called the after-arc phenomena. It is experimentally assured that the arc space has a conductivity over a comparatively long time after the arc goes out, the reasons of which are detected experimentally. Author

N63-11919 Pfaudler Co., Rochester, N.Y.

DEVELOPMENT OF PRACTICAL TECHNIQUES FOR APPLYING PROTECTIVE COATINGS TO COLUMBIUM ALLOYS Quarterly Progress Report No. 2, Sept. 1-Nov. 30, 1962

J. Zupan, P. J. Chao, and J. B. Whitney Dec. 15, 1962 34 p 1 ref
(Contract AF 33(657)-8920)
(PF-62-15)

Practical techniques for applying protective coatings to columbium alloys are being investigated by studying three coating processes: fused salt bath, fluidized bed, and slurry dip and spray application. D-14 alloy (Cb-5Zr), 20-mils thick, has been selected for the substrate to be employed initially. In the fused salt bath work, detailed studies were made of the deposition of Ti. Baths containing different concentrations of titanium and iodine were used under several process conditions to produce successively thicker coatings on D-14. The bulk of the work on fluidized bed deposition continues to be concerned with investigation of basic process variables and improvement of the experimental apparatus. Despite operational difficulties, the first D-14 specimens were successfully coated with Mo-W-Si and showed promise in the torch test. Coatings of the Al-Cr and Sn-Al types, applied with slurry dip and spray techniques using water or lacquer as the vehicles, have given scattered results in the torch test, but some coatings performed well. Basic mechanisms of suspension stability are being studied with the new electrophoresis apparatus. Author

N63-11930 Aerospace Information Div., Library of Congress, Washington, D.C.

DIE FORGING WITH COUNTERPRESSURE

Jan. 8, 1963 3 p Review of: A. V. Rebel'skiy and V. A. Zolonitskiy Closed-impression die forging with counterpressure Kuznechno-shtampovochnoye proizvodstvo, no. 10, 1962 p 1-5
(AID S-63-3) OTS: $1.10 ph, $0.80 mf

A new-design closed-impression die has been developed to overcome the major drawback in flashless forging, e.g., the variation in the volume of the blank. A compensation cavity for excess metal is provided in the die by means of a spring-type counterpressure device. The advantages of this die over conventional flash gutter dies are as follows: 25% reduction in force requirement; 10% longer die life; metal consumption 10 to 15% lower metal consumption; reduction in forging steps; and increased dimensional precision. Due to the creation of hydrostatic compression conditions in the material undergoing forging, this die should be applicable for forging even the most difficult-to-forge refractory metals. R.C.M.

N63-11941 Bettis Atomic Power Lab., Westinghouse Electric Corp., Pittsburgh, Pa.

A SURFACE FINISH STANDARD FOR RADIOGRAPHING WELDS

J. F. Gipson *In its* Bettis Technical Review: Reactor Technology. Dec. 1962 p 53-57 (See N63-11937 04-23) OTS: $2.25

Surface-finish requirements for welds in pipe and pressure vessels were not consistently and explicity defined. An investigation was therefore undertaken to determine the extent of surface conditioning of welds necessary for satisfactory radiography. As a result of a series of tests, it is concluded that a surface finish of 1000 μin. rms is adequate, provided that all welding code and material specifications are satisfied. Author

18 MATERIALS, METALLIC

Includes: cermets; mechanical and physical properties of alloys and metals; and metallurgy.

For related information see: 07 Chemistry; 17 Machine Elements and Processes; 19 Materials, Non-metallic; 33 Stresses and Loads; and 34 Structural Design.

N63-11570 Alloyd Electronics Corp., Cambridge, Mass.

AN INVESTIGATION OF METALLIC THIN FILM COMPOSITE MATERIALS

R. A. Covert and E. Rabinowicz Wright-Patterson AFB, Ohio, Directorate of Materials and Processes, June 1962 49 p 10 refs
(Contract AF 33(616)-6479 and AF 33(616)-7091)
(ASD-TDR-62-617)

This report covers a study of metallic, multiple-layer composite materials. Samples of Ag-Cr, Ag-Fe, Ag-Cu, Ag-Mg, Pb-Sn, Cd-Sn and Pb-Sn have been considered. Three fabrication techniques were considered (alternate evaporation in vacua, alternate electroplating, and cold rolling of alternate layer stacks). Significant strength increases over pure and alloy materials have been observed for Ag-Cu and Pb-Sn composites. These strengths do not approach the theoretically predicted levels. Author

N63-11579 Defense Metals Information Center, Batelle Memorial Inst., Columbus, Ohio

REVIEW OF RECENT DEVELOPMENTS—TITANIUM AND TITANIUM ALLOYS

R. A. Wood Dec. 21, 1962 5 p 14 refs

Recent developments in titanium metallurgy are reviewed. Titanium-cobalt binary alloys and titanium-aluminum-vanadium-cobalt alloys were found to be readily forgeable. The quaternary alloys were heat treatable to high strength and good ductility. The fatigue strength of the Ti-6Al-4V-4Co composition was found to be about 20 ksi higher than the commercial alloy in the annealed condition. The TMCA indicated that Ti-6Al-4V and Ti-5Al-2.5Sn appear to be good candidates for cryogenic service. Ti-6Al-4V proved superior to Iconel X, 70/30 Brass, Type 347 SS, Cu-2Be-1/2 HT and Ni-Span C in fatigue/density tests for most conditions of temperature and notch sharpness. Data are presented on specific heat and thermal conductivity of Ti-6Al-4V, Ti-4Al-3Mo-IV, Ti-2.5Al-16V and T-13V-11Cr-3Al. Evaluations conducted on the superalpha alloys continued to show the superiority of these compositions at elevated temperatures. Data on tensile properties of Ti-6Al-4V and Ti-5Al-2.5Sn Eli grades are presented. The state of the art of titanium-oxygen reactivity is presented. I.v.L.

N63-11599 California Inst. of Tech. W. M. Keck Lab. of Engineering Materials, Pasadena

DISLOCATION MOBILITY IN ZINC SINGLE CRYSTALS Final Technical Report

K. H. Adams and T. Vreeland, Jr. Dec. 1962 43 p 4 refs
(Contract Nonr-220(37))

This report presents the results of a study of dislocation mobility in high-purity zinc single crystals. Dislocation positions were determined using a special etching technique, and the dislocation density and configuration was determined before and after static loading and stress-pulse loading. Loading at stress levels slightly below the flow stress produced local dislocation rearrangement, with the maximum dislocation displacement somewhat less than the subboundary spacing. At the flow stress, dislocations penetrate the subboundaries, and relatively large dislocation displacements are indicated (comparable to the specimen dimensions) in stress-pulse tests of approximately 30-sec duration. Short-duration stress-pulse loading at a stress level approximately 70 times the flow stress produced a maximum dislocation velocity of approximately 6 percent of the shear wave velocity. Author

N63-11602 Armour Research Foundation, Chicago, Ill.

THE EFFECT OF ADDITION ELEMENTS ON THE RATE OF BETA GRAIN GROWTH IN ALPHA-BETA AND BETA TITANIUM ALLOYS [Final Report, Feb. 1961-Mar. 1962]

F. A. Crossley Wright-Patterson AFB, Ohio, Directorate of Materials and Processes, Nov. 1962 60 p 15 refs
(Contract AF 33(616)-7687)
(ARF-2213-14; ASD-TDR-62-520)

Minor alloying additions have been evaluated for inhibiting beta grain growth in unalloyed titanium, B-120VCA, and Ti-8Al-1Mo-IV. The additions were: 0.11B, 0.05S, 0.45Ag-0.74Hf, 0.57Ba, 0.36Sr, and a multiple addition 0.03S-0.12Ba-0.15Hf-0.07Sr-0.01B. The boron and sulfur additions produced particulate phases in the alloys; and only these additions were effective in titanium and Ti-8Al-1Mo-IV. The barium addition, which apparently was soluble, was only slightly less effective than additions of boron or sulfur in B-120VCA. Room temperature tensile properties gave no indications of detriment to mechanical properties due to any of the additions. Strontium appeared to be beneficial to ductility through a scavenging effect. Author

N63-11605 Joint Publications Research Service, Washington, D.C.

TRANSLATIONS ON STEEL

B. Ye. Paton et al Jan. 7, 1963 25 p 17 refs Transl. of two articles from Stal' (Moscow), no. 11, 1962 p 1001-1005 and 1035-1039
(JPRS-17016) OTS: $2.60

CONTENTS:

1. ACHIEVEMENTS AND PROSPECTS OF ELECTROSLAG REMELTING B. Ye. Paton, B. I. Medovar, B. I. Maksimovich, and L. M. Stupak (Electrowelding Inst. im. Ye. O. Paton, Acad. of Sci. Ukrain. SSR) p 1-11 13 refs
2. STAINLESS STEELS WITH REDUCED NICKEL CONTENT M. V. Pridnatsev and A. A. Babakov p 12-22 4 refs

N63-11682 Joint Publications Research Service, Washington, D.C.
METHOD OF INVESTIGATING THE HARDNESS OF TITANIUM- AND CHROMIUM-CARBIDE-BASE CERMETS AT NORMAL AND ELEVATED TEMPERATURES
N. I. Valuyev (Inst. of Mech. Eng., Acad. of Sci. USSR) Jan 8, 1962 11 p 5 refs Transl from Izv. Vysshikh Uchebn. Zavedenii, Mashinostro. (Moscow), no. 6, 1962 p 124-128
(JPRS-17040) OTS: $1.10

The procedure is discussed for determining the hardness of a number of titanium- and chromium-carbide-base cermets at normal and elevated temperatures. The results of determining the hot hardness values are given for nine cermets with heat resisting binders. The causes of extensive straggling of experimental data are considered. The procedure employed for determining the hardness of such materials is amended. J.R.C.

N63-11721 Syracuse U. Research Inst., N.Y.
AIR WEAPONS MATERIALS APPLICATION HANDBOOK—METALS AND ALLOYS
G. Sachs and R. Ford Pray III, eds. Wright-Patterson AFB, Ohio, Wright Air Development Center, Dec. 1959 568 p 2 refs First edition; for Supplement see N63-11722 04-18
(Contract AF 18(600)-1794)
(ARDC-TR-59-66)

This handbook consolidates into one volume the latest and most up-to-date data on the properties of metals and alloys of primary importance for the production and design of air weapons. Author

N63-11722 Syracuse U. Research Inst., N.Y.
AIR WEAPONS MATERIALS APPLICATION HANDBOOK—METALS AND ALLOYS, SUPPLEMENT I
V. Weiss, R. V. Jelinek, J. G. Sessler, B. A. Wasil, J. V. Latorre, and R. D. Ziemer Wright-Patterson AFB, Ohio, Directorate of Materials and Processes, Aug. 1962 237 p refs For First edition see N63-11721 04-18
(Contract AF 33(616)-7792)
(ARDC-TR-59-66, Supplement I)

This supplement to the first edition of the Handbook contains the data accumulated and assembled on 40 additional metals and alloys in a self-contained volume. Part II of the Supplement contains source references for all data presented. Abbreviations, a glossary, and a cross index of all alloys contained in the first edition and in the supplement are given. Author

N63-11758 Massachusetts Inst. of Tech., Cambridge
FINE STRUCTURE OF AUSTENITE PRODUCED BY THE REVERSE MARTENSITIC TRANSFORMATION Technical Report No. 8
George Krauss, Jr. Sept. 1, 1962 24 p 11 refs
(Contract Nonr-1841(35))
(DSR-7618)

The fine structure introduced into austenite by the reverse martensitic transformation was investigated by transmission electron microscopy in an iron-33.5 w/o nickel alloy. Direct martensitic transformation induced by cooling to −195° C produces finely twinned martensite surrounded by retained austenite containing relatively uncomplicated dislocation arrangements. On rapid heating to 450° C, the reverse transformation replaces these structures with tangled and jogged dislocations in concentrations up to 10 inches per sq. cm., and thereby accounts for the marked strength increases observed in reversed austenite. In some previously martensitic areas of the reversed austenite, twins up to 5 microns in width are observed with standard metallographic techniques. Selected-area electron diffraction confirms the twinned nature of these structures, and it is found that the twins are quite imperfect and contain a high concentration of tangled dislocations. Author

N63-11769 Watertown Arsenal. Materials Research Lab., Mass.
LOCALIZED MAGNETIC MOMENTS IN METALS
A. J. Freeman Nov. 1962 9 p
(MRL-125)

A simple model is used to obtain information about localized magnetic moments in metals from Mössbauer (or nuclear magnetic resonance) experiments. The formulation emphasizes the explicit dependence of the hyperfine field on the spin S′ of the Fe atom and shows why the temperature dependence of the hyperfine field follows a Brillouin function of the total localized spin S (with $S \neq S'$). The moment of Fe atoms in dilute concentrations of Pd, Rh, and Mo are determined, and the apparent contradiction between Mössbauer and susceptibility measurements for Rh and Mo is discussed. Author

N63-11786 Massachusetts Inst. of Tech., Cambridge
INVESTIGATION OF THE STRENGTHENING MECHANISMS OF DISPERSION-STRENGTHENED ALLOYS [Final] Technical Documentary Report [Mar. 15, 1961-May 15, 1962]
Richard J. Murphy, Varadachari Sadagopan, and Nicholas J. Grant Wright-Patterson AFB, Ohio, Directorate of Materials and Processes, Nov. 1962 31 p 38 refs
(Contract AF 33(616)-8085)
(ASD-TDR-62-734)

To produce dispersion-strengthened alloys with higher strength properties than oxide dispersion-strengthened systems, Ni-TiB_2 and Ni-TiC were selected. Dilute binary alloys of C, B, and Ti in Ni were prepared, both in bar and powder form. Diffusion couples between dilute alloys of Ni-C and Ni-Ti, as well as between Ni-B and Ni-Ti, were examined in a preliminary way. Lack of appreciable diffusion across the boundary motivated the preparation of alloys by means of powder interactions. Positive interactions were observed, but measurements of intermetallic particle size and interparticle spacing have not yet been made. Use of a higher Ti alloy shows more extensive diffusion interaction, suggesting use of less dilute alloys. Author

N63-11872 Joint Publications Research Service, Washington, D.C.
TITANIUM IN SOVIET POWDER METALLURGY
Jan. 16, 1963 59 p 19 refs Transl. of 5 articles from Titan i Yego Splavy, Metaloved. Titana (Moscow), v. 3, p 3-16, 84-89, 99-106, and 152-158
(JPRS-17155) OTS: $5.60

Five papers discussing titanium powder metallurgy in the Soviet Union are presented. The topics covered are: (1) investigation of the microstructure and mechanical properties of alloys of titanium with aluminum; (2) effect of heat treatment on the structure and properties of titanium alloys; (3) powder metal alloys with high specific tenacity; (4) development and investigation of titanium-base powder metal alloys; and (5) rolling of titanium powder into thin strip by the Gorkiy Polytechnic Institute method. This method of cold rolling of both the powder and the strip avoids saturation of the titanium by gases and eliminates the need for cleaning and etching. M.P.G.

N63-11887 Denver Research Inst., Colo.
MOLYBDENUM AND THE EFFECTS OF MINOR ADDITIONS OF YTTRIUM
Donald T. Klodt, C. Samuel Miller, and Joseph F. Nachman 17 p 10 refs Submitted for Publication
(NASA Grant NsG-61-60)
OTS: $1.10 ph, $0.80 mf

The effects of additions of yttrium as a scavenger of the interstitial oxygen and grain-boundary oxides in molybdenum were studied. Continuously cast small-diameter molybdenum ingots were prepared by melting compacted powder charges of the base metals and yttrium hydride in a nonconsumable electrode arc furnace under an argon atmosphere. The soundness and structure of the ingots were

improved when the argon pressure was reduced to approximately 50-mm Hg. The ingots were machined to remove surface imperfections and then swaged into rods from which impact specimens were prepared. A recrystallization study was conducted, and all specimens were given a 1-hr. recrystallization anneal prior to final machining. Impact tests were made over a range of temperatures and the ductile-to-brittle transition temperature determined. The ductile-to-brittle transition temperature of a 99.2 w/o Mo-0.8 w/o Y alloy is lowered by approximately 200° C compared to the unalloyed molybdenum prepared by the same techniques. Retention of yttrium in the molybdenum after arc melting is of the order of 5 percent of the amount added. Author

N63-11912 Rutgers U. Coll. of Engineering, New Brunswick, N.J.
FATIGUE STUDIES OF METAL CRYSTALS Final Report
A. Shrier, J. P. Wallace, J. J. Slade, Jr., E. C. Easton, and S. Weissmann Jan. 1963 30 p 19 refs Submitted for Publication
(Contract AF 49(638)-17)

Single crystals of silver and zinc were fatigued in alternating bending at constant strain amplitude of 0.12% and 0.2% for silver and 0.01% for zinc. They were studied by a combination of several X-ray techniques (double-crystal diffractometer, divergent beam, X-ray reflection microscopy), electron transmission microscopy and hardness measurements. The experimental results indicate that the fatigue process may be divided into three stages. The initial stage can be identified with cyclic work-hardening and is attributed to a general increase in dislocation density. The second stage represents a period of dynamical recovery. It consists in the removal of dislocations from distorted lattice domains and leads to a decrease of coarse lattice misalignments. At this stage cross-slip seems to play a fundamental role, as a process by which dislocations can escape from their locked positions. When cross-slip was obstructed by a high-angle boundary in silver or a twin boundary in zinc, a premature fatigue failure occurred at the obstruction. The third stage is characterized by an extensive fragmentation of the structure. Author

19 MATERIALS, NONMETALLIC

Includes: mechanical and physical properties of non-metals (e.g., plastics).

For related information see: 07 Chemistry; 17 Machine Elements and Processes; 18 Materials, Metallic; 33 Stresses and Loads; and 34 Structural Design.

N63-11575 Bausch and Lomb, Inc., Rochester, N.Y.
STUDY OF NON-OXIDE MATERIALS WITH DEFECT STRUCTURES Annual Report October 27, 1961-October 26, 1962
Dean A. Buckner and Norbert J. Kreidl Oct. 26, 1962 34 p 9 refs
(Contract Nonr-3632(00); ARPA Order-269-62; Proj. Defender)

The principal basic crystal structure studied was that of perovskite, typified by the compound $KMgF_3$ and modified by both mono- and tri-valent cation substitutions. The compositional modifications attempted to promote anion vacancy, cation vacancy, or interstitial anion crystal-lattice defects. Substitutions attempted were Li^+ for Mg^{++}, with F^- vacancies; Al^{+3}, Ga^{+3}, Sb^{+3}, Sc^{+3}, In^{+3} for Mg^{++} with either K^+ vacancies or F^- interstitials. Positive results were obtained using GaF_3, ScF_3 and InF_3. The Ga^{+3} substitution showed a refractive index increase of the modified perovskite structure. Substitutions of Sc^{+3} and In^{+3} revealed evidence for the incorporation of these cations into the perovskite structure without refractive index change, but indicated a symmetry change of the crystal lattice plus a definite phase change at high concentrations. Both hot pressing of powdered polycrystalline $KMgF_3$ and single crystal growth of $KMgF_3$ demonstrated the feasibility of using these techniques for obtaining specimens for physical property determinations. Author

N63-11697 Pratt and Whitney Aircraft, East Hartford, Conn.
DETERMINATION OF THE EMISSIVITY OF MATERIALS Progress Report, Jan. 1 through June 30, 1962
W. H. Askwyth 1962 19 p
(NASA Contract NASw-104; Amend. 1-8)
(PWA-2088) OTS: $1.60 ph; $0.80 mf

An aluminum phosphate-bonded mixture of nickel-chrome spinel and silicon dioxide completed 7200 hours of endurance on a SNAP-8 finned-tube radiator segment. Plasma flame-sprayed coatings of titania on SNAP-8 and Sunflower I sections completed 5900 hours. A fourth rig containing a SNAP-8 section with an aluminum phosphate-bonded mixture of nickel-chrome spinel and silicon dioxide accumulated 4630 hours. Changes in the spectral-emittance rig to simplify testing, provide greater accuracy, and extend the range of operating conditions are described. The design and construction of a new total-emittance rig are described. The results of an endurance test of a calcium titanate coating on a columbium tube are given. Author

N63-11794 General Electric Co. Space Sciences Lab., Philadelphia, Pa.
THE PYROLYSIS OF PLASTICS IN A HIGH VACUUM ARC IMAGE FURNACE II
H. L. Friedman Dec. 1962 29 p 5 refs
(Contracts AF 04(647)-269 and AF 04(647)-617)
(R62SD57-Class I)

Samples of glass- and nylon-reinforced CTL 91-LD Phenolic and G. E. 124 Resin were pyrolyzed in an arc-image furnace at high vacuum. Compositions of the various degradation gases are reported. Average molecular weights of these gases were calculated. A description of the mechanism of pyrolysis of G. E. 124 Resins is presented. A critique of the method is included. Author

N63-11797 California U., Berkeley. Lawrence Radiation Lab.
DEFORMATION AND FRACTURE OF POLYCRYSTALLINE LITHIUM FLUORIDE
William D. Scott (Ph. D. Thesis) Sept. 14, 1962 84 p 37 refs
(Contract W-7405-eng-48)
(UCRL-10435) OTS: $2.00

Techniques for forming polycrystalline LiF from the melt and for fabricating test specimens were developed and evaluated using single-crystal LiF as a control. Large-grain polycrystalline specimens tested in four-point loading always showed some plastic deformation (0.076% to 0.798%) before fracture, but the plastic flow was sharply reduced from that of single crystals. An etch was developed revealing dislocations on all crystallographic faces of LiF. Details of plastic deformation in polycrystalline material were investigated. Deformation was inhomogeneous among the grains of an aggregate because of differences in orientation with respect to the applied stress, and also within individual grains because of interactions between adjoining grains. Grain boundaries were barriers to slip, but stresses resulting from slip in one grain were transmitted to neighboring grains and often caused local deformation near the boundary. Because of local stresses, local slip systems operated although the resolved shear stresses on them from the applied load were below the critical yield stress. In one case, slip occurred on an (010) plane. Three-grain junctions were areas of high residual stress. Fractures originated at boundaries at or near 3-grain junctions, not as a result of inherent boundary weakness but rather because of high stresses developed at the boundary. A quantitative expression for fracture originating in a slip band was applied to one type of fracture. Author

N63-11854 Rolla Metallurgical Research Center. Bureau of Mines, Mo.

BENEFICIATION OF REFRACTORY CLAY

H[oward] E. Powell, W. A. Calhoun, and C. K. Miller 1963 52 p 13 refs

(BM-RI-6142)

Because of increasing consumption of high- and super-duty refractories, the Bureau is studying the feasibility of beneficiating submarginal and marginal clays. Diverse mineral dressing tests were used to beneficiate samples from the east-central Missouri fire clay district. Standard ASTM tests were used to determine refractory properties of both crude and beneficiated clay samples. Marginal and submarginal clays containing impurities were effectively beneficiated by both wet-cyclone and wet-table treatment, but the wet-cyclone treatment was cheaper. Ion-exchange resins in the hydrogen form will probably prove more effective in removing potassium, the only alkali in Missouri fire clays to be a problem. Resins with greater cross linkage are more effective than resins with less. Roasting the crude clays before removing alkalis by chemical leaching was ineffective. By applying ultrasonic energy at a frequency of 10 to 25 kilocycles to aqueous suspensions of the clays, subsequent ion-exchange extraction of potassium was slightly improved. Higher frequency ranges did not help. Author

N63-11889 Servo Corp. of America, Hicksville, N.Y.

INVESTIGATE THE PROPERTIES OF GLASSES TRANSMITTING IN THE 8 TO 14 MICRON REGION Final Technical Report

C. J. Billian Jan. 2, 1963 74 p

(Contract Nonr 3647(00); ARPA Order 269-62; Proj. Defender)

(SCA-34300)

This final report presents information obtained on new, non-oxide, infrared transmitting glasses selected from the composition field of As-S-Se-Te. These glasses were selected from proprietary glass compositions discovered at Servo Corporation of America. The primary selection criteria were softening temperature in excess of 100° C and good optical transmittance in the 8- to 14-micron region of the electromagnetic spectrum. Results on systematic composition series show that the primary requirements of softening point and infrared transmittance are satisfied if the glass compositions are limited to the As-Se-Te field without sulfur. Surfur inhibits the infrared transmittance producing a 10% cutoff at approximately 13.5 microns, whereas glasses containing As-Se-Te transmit well out to 16 microns. A wide range of compositions has been selected to obtain 20 glasses representing a spread in optical and physical properties which will be of significant interest to the designer of wide angle, high resolution optical systems. Procedures, methods, and results for the initial selection of glasses, properties obtained, property measurements, and equipment used to conduct the various measurements are described. Compositions, optical, chemical, electrical, and physical properties are presented for 20 glasses. Author

20 MATHEMATICS

Includes: calculation methods and theory; computers; data processing; and numerical analysis.

For related information see: 08 Communications; 09 Electronics; 10 Facilities; and 22 Navigation and Guidance.

N63-11566 Oak Ridge National Lab., Tenn.

KINEMATICS II: A NONRELATIVISTIC KINEMATICS FORTRAN PROGRAM TO AID ANALYSIS OF NUCLEAR REACTION ANGULAR DISTRIBUTION DATA

J. B. Ball July 24, 1962 31 p 7 refs

(Contract W-7405-eng-26)

(ORNL-3251) OTS: $0.75

A FORTRAN program has been written for the IBM 709/7090 computer to facilitate the handling of angular distribution data. The program computes, as a function of laboratory angle, the center-of-mass angle of the observed particle, the ratio of the center-of-mass cross section to the laboratory cross section, the laboratory energy of the observed particle, the magnetic rigidity of the observed particle, the laboratory energy of the associated particle, the laboratory angle of the associated particle, the momentum-exchange wave number for the reaction, and the scattering argument (product of the momentum-exchange wave number and the nuclear interaction radius). Author

N63-11567 Maryland U. Inst. for Fluid Dynamics and Applied Mathematics, College Park

BOUNDS ON THE TRUNCATION ERROR BY FINITE DIFFERENCES FOR THE GOURSAT PROBLEM

B. E. Hubbard and A. K. Aziz (Georgetown U.) May 1962 31 p 20 refs

(NSF Grant G-17826; Contract AF 49(638)-228)

(BN-289; AFOSR-2727)

A finite difference analog is formulated for the boundary value problem $U_{xy} = f(x, y, U_x, U_y, U)$, $U(x,O) = Q(x)$, $U(O,y) = \psi(y)$. For the linear case $U_{xy}(x,y) + a(x,y)U_x(x,y) + b(x,y)U_y(x,y) + c(x,y)U(x,y) = d(x,y)$ a finite difference analog of Riemann's function is developed. It is shown that the truncation error is bounded explicitly in terms of the data of the problem, which is of $O(h^2)$, where h is the mesh size. Bounds of the same order are obtained for the error in approximating the derivatives U_x, U_y, and U_{xy}. Similar results are derived for the nonlinear case if f satisfies certain continuity and differentiability conditions. Author

N63-11568 North American Aviation, Inc. Space and Information Systems Div., Downey, Calif.

A GENERAL COMPUTER PROGRAM FOR THE DETERMINATION OF RADIANT-INTERCHANGE CONFIGURATION FACTORS

Kempton A. Toups Apr. 30, 1962 121 p 2 refs

(Contract AF 33(616)-8323)

(SID-62-393; ASD-TN-61-101)

A new analytical method is derived for determining the radiant-interchange geometric configuration factor. A digital-computer program utilizing this method is developed, that enables a rapid and accurate means of computation. Given the spatial coordinates of the source, such as any general polygon, and the spatial coordinates of the receiver, which may be either another general polygon or the silhouette of a general polyhedron, the program will compute the configuration factor from the source to the receiver. The configuration factor is computed rapidly, averaging approximately two seconds for trapezoids, and with any desired degree of accuracy. Sample problems illustrating the use of the program are presented. These examples also point out the accuracy and flexibility which is of prime interest to the programer. Author

N63-11584 RAND Corp., Santa Monica, Calif.

SOME THEOREMS CONCERNING THE MOTION OF AN ELECTRICALLY CHARGED PARTICLE IN A DIPOLE MAGNETIC FIELD

Ernest C. Ray and Joseph E. Kasper (Iowa State U.) Repr. from Ann. Phys., v. 20, no. 1, Oct. 1962 p 119-131 8 refs

(NASA Contracts NASW-17; NAS5-276)

We prove various theorems of the theory of the motion of an electrically charged particle in a dipole magnetic field as applied to cosmic rays. The theorems are essentially those conjectured by

Schremp. In making the proofs, we assume that the so-called trajectories of the first and second kinds have certain properties. These properties can be verified numerically and by series expansions in any particular case. Author

N63-11601 Argonne National Lab., Ill.

APPLIED MATHEMATICS DIVISION SUMMARY REPORT, JULY 1, 1961 THROUGH JUNE 30, 1962

William F. Miller [1962] 68 p refs
(Contract W-31-109-eng-38)
(ANL-6641)

This summary report consists of a listing of each computer program initiated during the reporting period, together with code symbols indicating the extent to which information concerning the program is readily available. Programs previously reported in which changes or additions have been made are included. The brief summary of each program listed includes a brief description of the program, a line encoded to indicate the machine for which the program was prepared, references applicable to the program, the status of library information concerning the program, and its mathematical classification. A.S.

N63-11612 National Aeronautics and Space Administration, Washington, D.C.

AN EXPERIMENT IN THE USE OF PUNCHED CARDS IN THE STUDY OF PROBLEMS RELATING TO TEKTITES

G. G. Vorob'yev Dec. 1962 8 p 6 refs Transl. by John F. Holman & Co., Inc. of "Opyt ispol'zovaniya perfokart pri izuchenii problemy tektitov" from Meteoritika (USSR), Issue 22, 1962 p 157-161
(NASA TT F-114) OTS: $0.50

A manual system has been worked out for sorting 10,000 or more punched cards for classifying and systematizing tektite data. The system may be adapted to the field of meteoritics proper with no special changes. Author

N63-11620 National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A METHOD FOR COMPUTING THE EFFECT OF AN ADDITIONAL OBSERVATION ON A PREVIOUS LEAST-SQUARES ESTIMATE

Patrick A. Gainer Washington, NASA, Jan. 1963 17 p 6 refs
(NASA TN D-1599) OTS: $0.50

Simple expressions are derived by which the effects of the new observation on the previously estimated regression coefficients and their covariance matrix may be computed without matrix inversion when observation errors are uncorrelated. The derivation is easily followed and produces an expression that is the same as that obtained from statistical filter theory for uncorrelated errors. Author

N63-11622 Courant Inst. of Mathematical Sciences, New York U., N.Y.

ON GENTLE PERTURBATIONS, I [Technical Report, 1 Sept. 1953-15 Aug. 1963]

P. A. Rejto May 1962 41 p 20 refs
(Contract DA-ARO-(D)-31-124-G159)
(IMM-NYU 295; AROD-938-32)

This report is an extension of the perturbation method of K. O. Friedrichs, inasmuch as it is not required that the disturbance should satisfy a certain "smallness" condition. More specifically, it is shown that for a wide class of operators, the "smallness" condition can be replaced by the following: the point eigenvalues of the disturbed operator are disjoint from the continuous spectrum of the undisturbed operator. Author

N63-11629 Bettis Atomic Power Lab., Westinghouse Electric Corp., Pittsburgh, Pa.

APPLICATIONS OF THE SIMPLIFIED SPHERICAL HARMONICS EQUATIONS IN SPHERICAL GEOMETRY

Ely M. Gelbard Apr. 1962 10 p 1 ref
(Contract AT-11-1-GEN-14)
(WAPD-TM-294) OTS: $0.50

The simplified spherical harmonics equations are derived in spherical geometry. With the aid of the spherical harmonics equations in simplified form it is shown that the main mode eigenvalue of a bare spherical reactor is equal to the second mode eigenvalue of the equivalent slab, provided that only P-0 and P-1 scattering components are present in the sphere. The equivalent slab is a bare slab having a thickness equal to the diameter of the sphere, and a composition which is the same as that of the sphere. Author

N63-11632 Northeastern U., Boston, Mass.

OPTIMAL SYNTHESIS OF AIR DEFENSE SYSTEMS IN TERMS OF MARKOV MODELS Scientific Report No. 9

Frank Di Cesare May 21, 1962 55 p 15 refs
(Contract AF 19(604)-4573)
(AFCRL-62-354)

A Markov model considering the possible states of an aggressor in an air defense system is presented. This model considers an air defense system as consisting of two basic operations: detection and neutralization. Two types of costs, construction and losses, are related in the model by means of a total cost function. The criterion for optimization is the minimization of the total cost function with respect to the pertinent transition probabilities. Examples illustrating the synthesis for a basic system are given, using various cost functions and utilizing alternative techniques for optimization, i.e., factorial method, univariate method, and the method of steepest descent. The techniques and results of these preliminary investigations are evaluated, and an example of the synthesis is illustrated, including those modifications shown to be necessary by the evaluation. The Markov model is extended to allow division of basic operations so as to form multiple lines of defense, and an example illustrating the synthesis for a double-line system is given. Author

N63-11638 Stanford U. Applied Mathematics and Statistics Labs., Calif.

TWO-PERSON MARKOV GAMES

G. Elfving June 1, 1962 43 p
(Contract Nonr-225(52))
(Tech. Rept. 77)

The present paper deals with sequential two-person non-zero-sum games in which the players' decisions are based on a fixed number of preceding moves. The decision rules are, in general, independent of time and may include randomization. The main results are, roughly, the following: (1) if the adversary's strategy is known, it is of no use to remember more than he does; (2) if the adversary's strategy is known, the optimal response strategy can be taken to be a deterministic (i.e., nonrandomizing) strategy; and (3) if the adversary's strategy is not known, both the above statements are, in general, false. Author

N63-11639 Stanford U. Applied Mathematics and Statistics Labs., Calif.

A CONVERGENT ASYMPTOTIC EXPANSION FOR MILL'S RATIO AND THE NORMAL PROBABILITY INTEGRAL IN TERMS OF RATIONAL FUNCTIONS

Harold Ruben June 8, 1962 23 p 23 refs
(Contract Nonr-225(52))
(Tech. Rept. 78)

A study is made of a convergent asymptotic expansion for Mill's ratio and the normal probability integral in terms of rational functions. It is shown that recent results in asymptotics may profitably

be used to develop new expansions for a wide class of integrals and, in particular, "tail" probabilities arising in various statistical applications. The expansions are of an asymptotic nature and have the additional advantage that, in statistical applications referred to, they are generally convergent. From a computational point of view this means that the expansions are effective for all values of the argument which are of practical interest. J.R.C.

N63-11641 Wisconsin U. Theoretical Chemistry Inst., Madison
A METHOD FOR CALCULATING VIBRATIONAL TRANSITION PROBABILITIES
K. Cashion May 1, 1962 102 p 44 refs
(Contract AF 33(657)-7311)
(WIS-AF-20, Ser. 3)

Relative vibrational transition probabilities for diatomic molecules can be calculated by methods utilizing band-intensity observations, or by methods not requiring such data. To date, the latter class has been represented solely by the linear dipole moment function approximation. In this paper, a second such method is developed. It makes use of wave function expansion technique of Trischka and Salwen. Its critical assumption is the approximate equivalence of the Morse and simple harmonic potentials in the region about the potential minimum. This assumption is sufficient to remove all ambiguity in the relative signs of the matrix elements of the dipole moment. Further, it provides a relation through which the relative magnitudes of the matrix elements can be calculated. It is shown that this method is equivalent to using Morse eigenfunctions with a dipole moment function which departs from linearity in a manner that is qualitatively correct, at least in the region of the equilibrium configuration. The method of the present paper has been applied to eleven diatomic molecules, many of which have been of interest in recent laboratory and upper-atmosphere investigations. The tabulated results for each include the matrix elements of the dipole moment relative to $R^{1,0}$ for all transitions with $v' \leq 9$. For purposes of practical application, the transition probabilities are also given in the form of Einstein A coefficients. In order that these may be converted easily into other commonly used units, values of the band origins are tabulated. Parameters of the dipole moment function are also given. The computational procedure used is outlined. It is not suitable for hand calculation but can be programed for a high-speed computer. On a large machine, about one minute is required to compute the entire contents of each table. Author

N63-11644 Naval Ordnance Lab., White Oak, Md.
POLARIS PROGRESS REPORT FOR MAY 1962—MATHEMATICS DEPT.
[1962] 2 p

This report covers materials studies on isotropic and anisotropic materials, and boundary-layer improvement studies. A.S.

N63-11645 Technical U. of Norway, Trondheim
SOME PREDICTIONS OF THE VALUES OF THE WAVE RESISTANCE AND MOMENT CONCERNING THE RANKINE SOLID UNDER INTERFACIAL WAVE CONDITIONS
T. Sabuncu May 1962 42 p 9 refs
(Norwegian Ship Model Experiment Tank Publ. 65)

Under interfacial wave conditions, a linearized theory of the moments acting on slender bodies is developed. The theoretical results obtained for wave resistance and moments are applied to a Rankine solid, and solutions are given in the form of curves. Although numerical calculations of the wave resistance rest upon linearized first-order theory, it has been found necessary to compute the moments through two approximations. Author

N63-11646 Michigan U., Ann Arbor
USEFUL IDENTITIES FOR HALF-SPACE PROBLEMS IN LINEAR TRANSPORT THEORY
R. E. Aamodt and K. M. Case June 1962 29 p 10 refs

A typical, translationally invariant, linear transport problem for a half-space is solved by the eigenfunction method. Using some derived identities for the solution of the associated homogeneous Hilbert problem, it is shown that the usual cumbersome integrals occurring in half-space problems can be reduced to a simple form. The usefulness of the identities is illustrated by solving the problem of a plasma confined to a half-space by a diffuse reflecting wall. Author

N63-11647 California U., Los Angeles
STABILITY QUESTIONS FOR SOME NUMERICAL METHODS FOR ORDINARY DIFFERENTIAL EQUATIONS Technical Report
Germund G. Dalquist May 1962 17 p 8 refs
(Contracts Nonr 233(24) and DA-04-495-ORD-1630)

A new technique for faster and cheaper numerical integration of differential equations by computers was reviewed. The type of instability considered was that due to choice of algorithm. Linear multistep methods of integration were chosen because this procedure made it possible to develop a rather general theory, instead of treating each method separately. Convergence, consistency, and stability theorems were presented and proved. The theorem, that there is only one linear multistep method with $p \geq k + 1$ which satisfies the condition that $|\zeta_{jh}| < 1$ when Re $hq < 0$, namely, the trapezoidal rule $x_{n+1} - x_n = \frac{1}{2} h(f_{n+1} + f_n)$, for which $p = 2$, $k = 1$, was proved. I.v.L.

N63-11666 Case Inst. of Tech. Statistical Lab., Cleveland, Ohio
PERCENTILE POINTS OF ORDER STATISTICS IN SAMPLES FROM BETA, NORMAL, CHI (1 D.F.) POPULATIONS
Zakkula Govindarajulu and Nicholas W. Hubacker Nov. 1962 42 p 10 refs
(Grant AFOSR 62-72)
(*Its* Publ. 101)

If $p(\alpha,i,N)$ denotes the α^{th} probability point of i^{th} smallest order statistic in random samples of size N drawn from the Beta distribution, $p(\alpha,i,N)$ is computed accurately to eight decimal places for $N = 1(1)30(5)60$, $i = 1(1)\,1+[N/2]$ and $\alpha = 0.01, 0.025, 0.10, 0.25, 0.50, 0.75, 0.90, 0.975, 0.99$. Also, the 25th, 50th, and 75th percentile points of the Beta distribution for $N = 65(5)100$, $i = 1(1)\,1+[N/2]$ are computed with the same accuracy. Using the above values, the percentile points of the normal, chi (1 d.f.), and Weibull order statistics in samples of sizes up to, and including, 30 are computed accurately to 4 or 5 decimal places. Applications of these tables are indicated. Author

N63-11667 Case Inst. of Tech. Statistical Lab., Cleveland, Ohio
BEST LINEAR UNBIASED ESTIMATION OF LOCATION AND SCALE PARAMETERS OF WEIBULL DISTRIBUTION USING ORDERED OBSERVATIONS
Zakkula Govindarajulu and Madhukar Joshi Nov. 1962 38 p 19 refs
(Grant AFOSR 62-72)
(*Its* Publ. 102)

Best linear unbiased estimation of the location and scale parameters of the Weibull distribution is considered. Tables are presented of: best linear unbiased coefficients for the ordered observations in censored and uncensored sample; the expected values and variances of the Weibull order statistics; and the product moments and the covariances of the Weibull order statistics. The sample sizes considered are up to, and including, 12. Throughout, values of practical interest for the shape parameter of the Weibull distribution are considered. Author

N63-11668 Case Inst. of Tech. Statistical Lab., Cleveland, Ohio
THEORY OF INVERSE MOMENTS
Zakkula Govindarajulu Sept. 1962 25 p 14 refs
(Grant AFOSR 62-72)
(*Its* Publ. 1066)

The characteristic function for inverse moments called the inverse characteristic function (inverse c.f.) is defined. Liafounov's inequality for inverse moments is obtained. Various properties, in particular the uniqueness property (also called the inversion formula), limit and continuity properties, are studied. Many results admit multivariate generalizations. Inverse order statistics are defined, and some applications of inverse moments are considered. Author

N63-11670 Queen's U., Belfast (Gt. Brit.)
AN EXPANSION METHOD FOR CALCULATING ATOMIC PROPERTIES II
M. Cohen, A. Dalgarno, and J. M. Mc Namee [1962] 26 p
(Contract AF 61(052)-131)
(AFCRL-62-646)

The accuracy of the methods of calculating the expectation values of perturbed atomic systems is analyzed by means of an expansion in inverse powers of the nuclear charge. Results are presented for the quadrupole polarizabilities and nuclear-shielding factors of all members of the helium and beryllium isoelectronic sequences. It is shown that the loss of accuracy entailed in replacing the full self-consistent method by a simpler one is small. Attention is drawn to the possible importance of configuration interaction between the $(1s^2\ 2s^2)\ ^1S$ and $(1s^2\ 2p^2)\ ^1S$ states of the beryllium sequence. Author

N63-11671 Queen's U., Belfast (Gt. Brit.)
THE CORRELATION ENERGIES OF THE HELIUM SEQUENCE
W. B. Somerville and A. L. Stewart [1962] 11 p 20 refs
(Contract AF 61(052)-131)
(AFCRL-62-647)

A study is made to determine the effect of interelectron interaction represented by the second order term of the wave function, depicting the ground state of the two electron systems in inverse powers of the nuclear charge. The equations for the separate angular harmonics of the first-order wave function are solved variationally using expansions in terms of one-electron orbitals, with the object of examining the rate of convergence as the number of orbitals in the trial solution is increased. The convergence of the harmonic expansion is found to be slow, the contributions falling off as $0.35/l^4$. The radial expansion is also slowly convergent, particularly in the case of the high-order harmonic contributions, $l \geq 5$. The calculations show that the contributions to the second-order energy from radial and angular correlation are -0.0286 and -0.0647 rydbergs, respectively, compared to the Hartree-Fock contribution, -0.2220 rydbergs. Author

N63-11674 Georgia U. Inst. of Statistics, Athens
PROGRESSIVELY CENSORED SAMPLES IN LIFE TESTING
A. Clifford Cohen, Jr., Aug. 16, 1962 24 p 12 refs
(Grant DA-ARO-(D)-31-124-G314)
(Tech. Rept. 12; AROD 2773-6)

In progressive censoring as in single-stage complete censoring, a distinction is to be made between censoring of type I, in which times of censoring are predetermined, and type II, in which censoring occurs when the number of survivors has been dropped to predetermined levels. Estimating equations for the two types are identical, but there are minor differences in estimate variances. This paper is primarily concerned with type I censoring. Author

N63-11689 Argonne National Lab., Ill.
SURFACE AND VOLUME PROPERTIES OF GROUND STATE NUCLEAR MATTER IN THE HARTREE-FOCK AND PUFF-MARTIN APPROXIMATIONS
John C. Reynolds Oct. 1962 122 p 18 refs
(Contract W-31-109-eng-38)
(ANL-6623)

A method is derived for computing the ground state properties of a spatially inhomogeneous self-bound system of many particles. This method is used to compute the density and effective potential across a plane surface of nuclear matter in the Hartree-Fock approximation, and in an approximation developed by R. D. Puff and P. C. Martin which takes into account certain two-body correlation effects. Author

N63-11696 Canadian Armament Research and Development Establishment, Valcartier
NUMERICAL SOLUTION FOR ONE-DIMENSIONAL HEAT CONDUCTION IN THE SKIN OF A RE-ENTRY VEHICLE
Pierre G. Ardouin (Computing Devices of Canada, Ltd.) Jan. 1962 42 p 8 refs
(CARDE-TM-666/62)

The problem of conductive heat transfer of reentry vehicles is formulated, and a computer program is written for automatic solution of the problem. The assumptions made for the problem are a straight line trajectory, a constant drag coefficient, and a uniform heat flux around the stagnation point. The problem is then treated as a case of variable heat flux to an infinite slab of thickness *L*. The computer program can be modified to run cases with constant or parabolic heat input. R.C.M.

N63-11698 Joint Publications Research Service, Washington, D.C.
TOWARDS THE THEORY OF ANALYTICAL DESIGN OF REGULATORS
N. N. Krasovskiy and A. M. Letov July 27, 1962 20 p 2 refs
Transl. from Avtomat. i Telemekh. (Moscow), v. 23, no. 6, 1962 p 713-720
(JPRS-14623) OTS: $0.50

This article presents a method for constructing the area of existence of a solution of the problem of the analytical design of optimal regulators, as well as some additional development of this problem associated with a break in the function v(x). Author

N63-11699 Case Inst. of Tech. Statistical Lab., Cleveland, Ohio
EXACT POWER OF SOME TWO-SAMPLE AND C-SAMPLE NONPARAMETRIC STATISTICAL PROCEDURES
George E. Haynam June 1962 111 p 22 refs
(Contract AFOSR-62-72)
(Case Statistical Lab. Publ. 1064)

Expressions for the exact power of the two-sample Mann-Whitney Wilcoxon U test procedure against alternatives of exponential and rectangular populations have been derived. Several examples for total sample sizes of 11 and 15 have been compared with Mood's median test. Mood's test is more powerful than the U test in all instances in which the number of observations from the null population exceeds the number from the alternative population. The converse is true when the number of observations from the null population is less than the number from the alternative. Author

N63-11701 Hebrew U., Jerusalem (Israel)
ON THE MECHANIZATION OF THE THEORY OF NUMBERS Technical Report No. 9
M. Machover and A. Robinson Sept. 1962 39 p 4 refs
(Contract N62558-2214)

The problem of mechanizing the theory of numbers is discussed and the proof of a theorem is analyzed for its application to machine proving. Kleene's system S is used and modified to exclude 0. The theorem xD(x,x) is proved by the free variable approach and the machine handling of each step is considered. R.C.M.

N63-11733 Aberdeen Proving Ground. Ballistic Research Labs., Md.
AUTOMATIC SELECTION OF DIGITAL ELECTRONIC COMPUTERS (ASDEC)
Martin H. Weik, Violet J. Confer, and Ralph R. Rosenberg Oct. 1962 22 p
(BRL-1176) OTS: $0.75

Engineering and programing descriptions of 327 electronic digital-computing and data-processing systems in the United States are given in a set of comparative charts, automatically prepared from a deck of punched cards. A method for automatic selection and evaluation of computing and data-processing systems is described. Author

N63-11737 Courant Inst. of Mathematical Sciences, New York U., N.Y.
FINAL REPORT [AND BIBLIOGRAPHY] OF SCIENTIFIC ACTIVITIES, OCTOBER 1957 TO MARCH 31, 1962
L. Bers June 26, 1962 5 p 31 refs
(Contract DA-30-069-ORD-2153)
(AROD-247-54)

This bibliography covers the following: subsonic and transonic gas dynamics, partial differential equations, quasi-conformal mappings and Riemann surfaces, and the theory of wave propagation. R.C.M.

N63-11747 Training Center for Experimental Aerodynamics, Rhode-Saint-Genèse (Belgium)
MATHEMATICAL STUDY ON KINETIC THEORY OF GASES APPLIED TO LOW DENSITY HIGH SPEED FLOW: A ONE DIMENSIONAL MATHEMATICAL MODEL FOR THE BOLTZMANN EQUATION Technical Note No. 10
Jean J. Smolderen Oct. 1962 59 p 13 refs
(Contract AF 61(052)-486)
(TCEA-TN-10)

A one-dimensional model for the Boltzmann equation, based on a Fokker Planck-like differential collision operator, is proposed, in order to study the validity of the usual approximation methods as well as the behavior of solutions near the free molecule limit. The corresponding fluid dynamic equations are derived, and the existence and structure of shocks is studied. The distribution function is obtained for the unsteady, spatially uniform problem and the existence of an infinite number of relaxation times and modes is proved. Linearized versions of the model equation are derived. The near free molecule limit for solutions of the full model equation is briefly investigated for steady state, and a boundary layer type of behavior is found to exist, the corresponding "boundary layer" approximation leading to a Gevrey type singular parabolic equation. The leading terms in the deviation from free molecule data are found to be of the order of the cube root of an interaction parameter playing a role analogous to the Knudsen number. Author

N63-11752 Argonne National Lab., Ill.
A TREATMENT OF SOME PERIODIC POTENTIAL PROBLEMS
Don Mc Coll and O. C. Simpson Nov. 1962 75 p 8 refs
(Contract W-31-109-eng-38)
(ANL-6647)

A new method of treating periodic potential problems is described. The classical Kronig-Penny problem is treated as an introduction to the applications, and the method is used to obtain the band structure for the periodic potential, the "parabolic scallop potential," consisting of a linear chain of segments of vertical parabolas opening upwards. The general problem for the one-dimensional periodic potential with reflection symmetry is then treated and illustrated by application of the method to the linear chain of inverted parabolic segments. As a third example, the band structure is obtained for the "hip-roof" potential. Finally, the three-dimensional problem is discussed. Author

N63-11766 European Atomic Energy Community, Brussels (Belgium)
NOUVELLE DEMONSTRATION DU THEOREME DE KÖNIG [NEW PROOF OF KONIG'S THEOREM]
A. Ostanello Università Commerciale Luigi Bocconi, Milan, [Nov.] 1962 18 p 6 refs In French; English summary
(Contract Euratom 015-61-5 CET-I)
(EUR-144.f; CETIS Rept. 55) Available from Belgian American Bank and Trust Co., N.Y., account No. 121.86; 30 Belg. Fr.

A mapping between real variables and the elements of the matrix A associated with a given directed graph G is defined in the following way:

$$(1)\quad (i,j) \neq 0 \rightarrow x_{ij} \neq 0$$
$$(i,j) = 0 \rightarrow 0$$

The determinant of the matrix A(x), which corresponds by (1) to the matrix A, is a polynomial, linear in each one of these variables, each monomial of which represents one graph factor. Author

N63-11777 Joint Publications Research Service, Washington, D.C.
AN ALGORITHM FOR THE ORGANIZATION OF INFORMATION
G. M. Adel'son-Vel'skiy and Ye. M. Landis Jan. 14, 1963 9 p 1 ref Transl. from Doklady Akad. Nauk SSSR (Moscow), v. 16, no. 2, 1962 p 263-266
(JPRS-17137) OTS: $1.10

An algorithm is described for the organization of information for machine storage and retrieval. The distribution of data points N are plotted so that the main storage has the shape of a permissible tree of branches not exceeding $3/2 \log_2 (N + 1)$ in length. It follows then that the minimum number of points in the tree equals $N_{n-1} + N_{n-2} + 1$. The retrieval of information stored by this algorithm requires $C \log_2 (N + 1)$ operations. R.C.M.

N63-11798 California U., Berkeley. Lawrence Radiation Lab.
INTRODUCTION TO PROJECT LOGIC PLANNING
William C. Bagot Oct. 1962 19 p
(Contract W-7405-eng-48)
(UCRL-10491) OTS: $0.50

A computer program, PROLOG, has been developed for the management of large-scale projects. In this variation of the critical path method, activities are first diagramed in their logical sequence, and only after this planning phase are times associated with the activities. The shortest possible duration of the project is the time required for the longest chain of sequential activities. Once the project duration has been calculated, the duration of each activity along the network can be obtained, and a time interval for completion of this activity can be established. This technique permits the use of more and randomly numbered node points and also provides for an exact relationship of working time with calendar time. Further, it provides a means by which those persons responsible for getting a task done can do their own planning after receiving information on how their task relates to the rest of the project. M.P.G.

N63-11802 New York U. Inst. of Mathematical Sciences, N.Y.
ON THE GENERALIZED OVERRELAXATION METHOD FOR OPERATOR EQUATIONS

W. V. Petryshyn June 14, 1962 24 p 3 refs
(Contract AT(30-1)-1480)
(NYO-9192)

The necessary and sufficient conditions for the spectrum of the generalized overrelaxation operator is derived:

$$T(\omega) = (D+\omega S)^{-1}\{(\omega-1)D + \omega Q\}$$

to lie in the interior of the unit circle centered at the origin. Author

N63-11813 Ames Lab., Iowa State U. of Science and Tech.

A FORTRAN PROGRAM FOR DETERMINING THE THERMAL DIFFUSIVITY OF FINITE LENGTH SAMPLES

Paul D. Maycock Sept. 1962 17 p
(Contract W-7405-eng-82)
(IS-507) OTS: $0.50

A FORTRAN program has been written which will make it possible to analyze thermal-diffusivity data on the IBM 704. The linear heat-flow equation is solved by the method of finite differences. Temperature-versus-time curves are obtained at three equally-spaced points along a finite cylindrical rod. The curves obtained at the two outer points are used as boundary conditions for the finite-difference calculus, and the diffusivity is determined by finding the computed solution which gives the best fit to the experimental data obtained at the midpoint. The new program has improvements which prevent the computer from calculating false values for the diffusivity, can operate with any of six preselected mesh sizes, and takes advantage of the capacity of the IBM 704. Author

N63-11862 Directorate of Research Analyses, Holloman AFB, N. Mex.

MINIMUM FUEL TRANSITIONS

John Thomas (New Mexico State U.) Nov. 1962 50 p 15 refs
(AFOSR/DRA-62-21)

The problem of finding the optimum method of transferring from one rocket orbit to another, where the criterion of optimality is that as little fuel as possible be expended in the maneuver, is examined. Papers devoted to the aspects of this question were reviewed. In some cases, several minor calculations in the process of comparing and contrasting similar papers were carried out. Author

N63-11863 Polish Academy of Sciences. Inst. of Mathematical Machines, Warsaw

[A STUDY OF ZERO-ONE DIAGRAMS, FLOW-DIAGRAMS AND RELAY SYSTEM FOR DIGITAL COMPUTERS]

Leon Lukaszewicz Warsaw, Central Inst. for Information on Technical and Economic Studies, 1962 24 p 14 refs Transl. by Maria Rojowska of three articles from Prace Zakladu Aparatow Mat. PAN (Warsaw), ser. A, nos. 1, 2, and 3, 1959 p 1-11, respectively (OTS-61-11303) OTS: $0.50

CONTENTS:

1. ZERO-ONE DIAGRAMS (WYKRESY ZERO-JEDYNKOWE) L. Lukaszewicz p 1-8 6 refs
2. A THEORY OF FLOW-DIAGRAMS (WYKRESY OPERACYJNE) L. Lukaszewicz p 9-15 4 refs
3. RELAY SYSTEM FOR DIGITAL COMPUTER CONTROL (SYSTEM SZTAFETOWY STEROWANIA MASZYNA CYFROWA) L. Lukaszewicz p 16-22 4 refs

N63-11879 Michigan U., Ann Arbor

THREE SOLUBLE PROBLEMS IN LINEAR TRANSPORT THEORY

Richard Edward Aamodt Aug. 1962 64 p 19 refs
(Supported by Eastman Kodak Fellowship, ONR, and Conductron Corp.)

Three exactly soluble problems in linear transport theory are considered. In the first problem, the one velocity, time independent, isotropic scattering, neutron transport equation with r^{-1} cross sections is solved exactly by two-sided Laplace transforms. The homogeneous solutions and the Green's functions are exhibited for both the infinite medium and the finite sphere. The diffusion approximation is compared to the exact result. In the second problem, a typical translationally invariant linear transport problem for a half-space is solved by the eigenfunction method. Using some derived identities for the solution of the associated homogeneous Hilbert problem, it is shown that the usual cumbersome integrals occurring in half-space problems can be reduced to a simple form. For the third problem, the particle density of a simple model of the exosphere is obtained by solving exactly the collisionless Boltzmann equation. The main point of the solution is that it is a discontinuous, multivalued function of the constants of motion. Results agree with those of other methods based on Newtonian mechanics. Author

N63-11944 Bettis Atomic Power Lab., Westinghouse Electric Corp., Pittsburgh, Pa.

CALCULATION OF COMPLEX NATURAL MODES FOR SPATIAL XENON OSCILLATIONS AND COMPARISON WITH A SIMPLE APPROXIMATION

R. L. Ewen *In its* Bettis Technical Review: Reactor Technology. Dec. 1962 p 85-93 5 refs (See N63-11937 04-23) OTS: $2.25

Complex natural modes associated with spatial xenon oscillations have been calculated for a series of cores in slab geometry and compared with the approximation to these modes suggested by Harris and Lacy. The very good agreement obtained for both damping factor and frequency is of considerable importance in view of the simplicity of the approximate method and the fact that, in many cases, it may be applied to detailed core descriptions using existing diffusion codes. Author

N63-11945 Diamond Ordnance Fuze Labs., Washington, D.C.

SOLUTION OF La GRANGE'S EQUATIONS BY ANALOG COMPUTATION

Arthur Hausner Nov. 12, 1963 13 p 5 refs
(TR-1088)

A procedure for solving LaGrange's equations of motion by analog computation is discussed. The problem of summing loop instabilities is minimized because the coefficient matrix of the acceleration terms in the generalized force equations is positive definite. No instability occurs if external generalized forces do not contain acceleration-dependent terms. A two-dimensional example is analyzed, and it is concluded that the existence of such terms will rarely cause computer instability for realistic physical systems. Author

21 METEOROLOGY

Includes: climatology; weather forecasting; lower atmosphere studies; and oceanography.

For related information see: 05 Astronomy and Astrophysics; 12 Geophysics; and 29 Space Sciences.

N63-11598 New York U. Coll. of Engineering, N.Y.

SOME SELECTED STUDIES ON THE WIND AND TEMPERATURE FIELDS OF THE TROPOSPHERE AND LOWER STRATOSPHERE Final Report

Wan-Cheng Chiu, Richard S. Greenfield, Paul A. Davis, and Harold L. Crutcher Aug. 1962 38 p 25 refs
(Contract AF 19(604)-6146)
(AFCRL-62-1023)

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2. BRIEF SUMMARIES OF THE FOLLOWING ARTICLES:
ARTICLE 1. THE PROBING OF THE TROPOPAUSE BY BALLOONS THAT FOLLOW IT—A SUGGESTION Wan-Cheng Chiu p 2-3 10 refs
ARTICLE 2. A STATISTICAL INVESTIGATION OF THE TROPOPAUSE OVER THE CENTRAL, TROPICAL PACIFIC Richard S. Greenfield p 4-8
ARTICLE 3. A RE-EXAMINATION OF THE HEAT BUDGET OF THE TROPOSPHERE AND LOWER STRATOSPHERE Paul A. Davies p 9-23 7 refs
ARTICLE 4. THE ENERGY EQUATION OF ATMOSPHERIC MOTIONS IN THE FREQUENCY DOMAIN Wan-Chen Chiu p 24-30 8 refs
ARTICLE 5. THE WIND SPECTRA OF THE TROPOSPHERE AND LOWER STRATOSPHERE OVER NORTH AMERICA Wan-Cheng Chiu and Harold L. Crutcher p 31-32

N63-11600 Imperial Coll. of Science and Tech., London (Gt. Brit.)
A CASE-STUDY OF THUNDERSTORMS ON AN OCCASION OF SMALL WIND SHEAR The Thunderstorm of 18 June 1957 over Southern England Technical (Scientific) Note No. 11
F. H. Ludlam Sept. 1962 31 p
(Contract AF 61(052)-254)
(AFCRL-62-1127)

An analysis is made of extensive radar and other observations of thunderstorms which occurred over southern England on 18 June 1957. These typical 'heat storms' are shown to be strongly influenced by the large-scale synoptic situation and by topographical effects. Although the instability was large the individual storms were short-lived, did not contain sustained draughts, and inefficiently converted potential into kinetic energy. The hail produced was only small and sporadic. In all these properties the behavior was in strong contrast to that of the severe Wokingham hailstorm. The difference is attributed to the absence of wind shear on the present occasion, in support of the new model previously advanced for severe local storms. Author

N63-11603 Army Electronics Research and Development Activity, White Sands Missile Range, N. Mex.
WHITE SANDS MISSILE RANGE CLIMATOGRAPHY, NR. 1
Paul H. Taft and Marjorie McLardie Hoidale Dec. 1962 58 p 6 refs
(SELWS-M-16)

The greater part of this report is a graphic presentation of hourly means and frequency distribution of cloudiness and average hourly wind speeds and prevailing directions, as well as thunderstorm and relative humidity data for "A" Station, located at Headquarters, White Sands Missile Range. In addition, tables and graphs are included for several other stations on or near WSMR, showing temperature and precipitation means and extremes and average snowfall, five-year means of winds aloft to 100,000 feet at Holloman Air Force Base, and a summary of surface inversions at "R" Station, seven miles east of Headquarters. Author

N63-11604 Army Electronics Research and Development Activity, White Sands, Missile Range, N. Mex.
METEOROLOCIGAL DATA REPORT, AEROBEE AC 3.138 (AF-89)
Gordon L. Dunaway Dec. 1962 40 p
(SELWS-M-17)

Meteorological data gathered for the launching of Aerobee AC 3.138 (AF-89) are presented for the Air Force Cambridge Research Center and for ballistic studies. Author

N63-11626 Army Electronics Research and Development Activity Huachuca, Fort Huachuca, Ariz.
NUMERICAL SOLUTION OF NONSTEADY SOIL MOISTURE TRANSFER, I Meteorological Research Notes No. 3
William D. Ohmstede Oct. 1962 71 p 5 refs
(ERDAH-MET-2-63)

A mathematical model of soil moisture transfer is described. A number of solutions obtained by numerical integration on a digital computer are presented. It is shown that these solutions can be used to determine the water-transmission characteristics of soils. Author

N63-11631 National Bureau of Standards, Boulder, Colo.
SYNOPTIC RADIO METEOROLOGY
B. R. Bean, J. D. Horn, and L. P. Riggs Oct. 1962 91 p 47 refs
(NBS-TN-98) GPO: $0.50

A survey of some of the advances in the field of synoptic radio meteorology is presented. The development of representative refractive index profiles for major air mass types is reviewed. Included is a description of several refractive index parameters currently in use by radio meteorologists. Two reduced-to-sea-level index forms developed at the National Bureau of Standards are used to illustrate the three-dimensional structure of a broad-scale storm system traversing the North American Continent. Author

N63-11710 Massachusetts Inst. of Tech., Cambridge
APPLICATION OF RADAR DATA TO FORECASTING OF TERMINAL WEATHER CONDITIONS Final Report
Pauline M. Austin Sept. 1962 54 p 2 refs
(Contract AF 19(604)-5220)
(AFCRL-62-1019)

Three separate projects are described in this report. The first is an investigation of the linear predictability of precipitation patterns as depicted by radar. The linear predictability of precipitation was shown to be relatively insensitive to reasonable variations in spatial density of data, but the spatial extent may be a critical parameter. The space resolution with which a forecast is made appears to influence, to some extent, the level of predictability. In the second study, comparison was made of the variations in precipitation rate, as measured by radar, with fluctuations in ceiling and visibility, recorded by rotating-beam ceilometers and transmissometers, respectively, at two airports which are located within a few miles of the radar site. It was found that the time scale of the variations is approximately the same for the three quantities, but the relationships between them differ for different storm types and geographical locations. A program in data reduction, whereby range-corrected iso-echo contours are transcribed to digital form suitable for numerical computations and statistical studies, is described. Author

N63-11852 Meteorological Office (Gt. Brit.)
SOME CALCULATIONS OF TERMS IN THE ENERGY BALANCE FOR MONTHLY PERIODS AT THE OCEAN WEATHER STATIONS I AND J IN THE NORTH ATLANTIC Scientific Paper No. 11
H. C. Shellard London, HMSO, 1962 16 p 11 refs
(MO-712) Available from HMSO: 3s.

The ocean weather stations I and J have now provided an almost continuous series of reliable and regular meteorological observations, made at more-or-less fixed points in the North Atlantic, for over 10 years. It is therefore possible to compute monthly mean values of the various meteorological elements with a quite high degree of accuracy, such means being based on eight observations a day throughout the month. It is worthwhile, therefore, to apply methods similar to those used by W. C. Jacobs to compute the various terms in the energy balance at the two stations on an individual monthly basis. The results obtained permit the relative importance of the different terms to be assessed for each station, and show how these terms varied throughout the year and from one year to another during the period 1948 to 1956. A comparison with the results obtained by Jacobs for the eastern North Atlantic is also made. Author

N63-11876 France. Direction de la Météorologie Nationale, Paris
FRÉQUENCES DES PLAFONDS BAS DES NUAGES, DES MAUVAISES VISIBILITÉS ET DES CONDITIONS NON-OPÉRATIONNELLES A ORLY ET AU BOURGET POUR PLUSIEURS SEUILS DIFFÉRENTS. ÉTUDE SUR LE DÉGAGEMENT DE CES AÉRODROMES [FREQUENCIES OF LOW CLOUD CEILINGS, BAD VISIBILITY, AND NON-OPERATIONAL CONDITIONS AT ORLY AND LE BOURGET FOR MANY DIFFERENT OCCASIONS. STUDY ON THE RELIEVING OF THESE AIRPORTS]
A. Tasson, R. Bubeck, and P. Charli Oct. 1962 88 p 1 ref In French
(Monographies de la Météorologie Nationale No. 26)

Statistics are presented for: (1) frequencies of low ceilings, bad visibility, and nonoperational conditions at Orly and Le Bourget airports; (2) number of cases where Orly has relieved Le Bourget and vice versa; (3) number of cases where both airports were closed; (4) number of cases where Tours has relieved Orly and Le Bourget; and (5) number of cases where Rheims has relieved Orly and Le Bourget. All statistical information deals with time of day and year. Studies at Orly and Le Bourget are from 1949 to 1958; those at Tours and Rheims are from 1949 to 1953. I.v.L.

N63-11881 Weather Bureau. Meteorological Satellite Lab., Washington, D.C.
INFRARED FLUX AND SURFACE TEMPERATURE DETERMINATIONS FROM TIROS RADIOMETER MEASUREMENTS
D. Q. Wark, G. Yamamoto, and J. Lienesch Aug. 1962 90 p 32 refs
(MSL Rept. 10)

The TIROS II meteorological satellite carried a multiple channel radiometer of medium resolution (about 5 degrees). Two of the channels were designed to measure the upward radiation in the "window" at 8 to 12 microns, and over the broad spectral region of 7 to 30 microns. To deduce surface temperatures and total upward flux values from the measurements in these two channels, additional operations must be carried out on the data. As a basis for these transformations, the specific spectral intensity over the entire infrared region was calculated at five zenith angles for each of 106 atmospheric models. In the 7 to 30 micron channel, an empirical relation was found to transform measured values to total intensity; and, from the limb-darkening exhibited by the 106 individual models, a method of calculating flux was formulated; in this case, the results contain inaccuracies of only about two percent attributable to the method used. In the 8 to 12 micron channel, the influence of ozone and water vapor was determined for the model atmospheres, and curves were developed for the direct transformation from measured values to surface temperature; however, if a knowledge of the water vapor content of the viewed column is lacking, errors in the inferred surface temperature can range from near zero to ten degrees or more. A series of radiative flux maps over Europe, calculated from the 7 to 30 micron data, have values whose magnitudes are in accord with other estimates and measurements. Corrected satellite 8 to 12 micron data are compared with shelter temperatures for several stations in a cloudless area; the range of the satellite data from 3.5 degrees higher to 5.0 degrees lower than the shelter data is discussed. Author

N63-11905 Industrial Science and Technology Agency. Electrotechnical Lab., Tokyo (Japan)
EXPERIMENTAL RESEARCH IN AGITATIONAL PHENOMENA ON POWER SYSTEMS
Yoshikazu Kitani June 1962 104 p 36 refs In Japanese; English summary
(*Its* Researches No. 629)

Experimental research conducted in agitational phenomena is described. The measuring instruments used are explained. Experimental and theoretical examinations concerning the capacity divider in use of coupling condenser are described. The result of a survey of agitational phenomena on 154-kv and 77-kv systems of Chubu Electric Power Company at the time of lightning stroke are given. The fault locator of transmission line is discussed. An account of overvoltage on P.C. system of open line is given. Author

22 NAVIGATION AND GUIDANCE

Includes: autopilots; star tracking; inertial platforms; and traffic control.

For related information see: 06 Auxiliary Systems; 08 Communications; 09 Electronics; 10 Facilities; 15 Instrumentation; 20 Mathematics; and 29 Space Sciences.

N63-11780 National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STUDY OF AN AUTOMATIC SYSTEM FOR CONTROL OF THE TERMINAL PHASE OF SATELLITE RENDEZVOUS
Edgar C. Lineberry, Jr., and Edwin C. Foudriat Washington, NASA, 1962 19 p 5 refs
(NASA TR R-128) GPO: $0.30

An analytical and simulation study was conducted of an automatic system to control the terminal phase of rendezvous between two space vehicles. The system employs switching and thrust orientation criteria based upon relative-motion parameters, first to establish a collision course, and then to reduce the range and range rate to zero, simultaneously. Techniques are developed for employing either modulated thrust or on-off thrust at a constant level. Results of the study indicate that the automatic system can effectively control rendezvous over a wide range of initial conditions and can utilize the available fuel in a very efficient manner. Author

N63-11809 Federal Aviation Agency. Systems Research and Development Service, Atlantic City, N. J.
EVALUATION OF THE TERMINAL RADAR SERVICE AREA CONTROL CONCEPT Final Report
D. Bottomley, R. Hansen, P. O'Brien, H. Rohland, and S. Rossiter Sept. 1962 99 p

A hypothetical terminal area with representative traffic was simulated, and control was performed by Air Traffic Service personnel presently engaged in active control at field facilities. The operational plan, including placement of equipment and positions of operation, procedures, and personnel staffing, was evaluated and further developed by exploratory testing. Comparative tests were made of several conditions and evaluated to determine effects on the Terminal Radar Service Area. Results indicated that the basic concept was feasible, and that operational plans can be developed for implementation in most high-activity terminal areas in the field. Author

23 PHYSICS, GENERAL

Includes: acoustics; cryogenics; optics; and thermodynamics.

For astrophysics see: 05 Astronomy and Astrophysics.

For related information see: 12 Geophysics; 29 Space Sciences; 24 Physics, Plasma; and 24 Physics, Solid-State.

N63-11555 Massachusetts U. Polymer Research Inst., Amherst
THE USE OF A LASER AS A LIGHT SOURCE FOR PHOTOGRAPHIC LIGHT SCATTERING FROM POLYMER FILMS
Marion B. Rhodes, Daniel A. Keedy, and Richard S. Stein June 25, 1962 6 p 3 refs
(Contract Nonr-3357(01))
(ONR-TR-46)

A method is described for measuring light scattering from polymer films with a laser light source. This method greatly reduces the exposure time required for the conventional mercury arc light source, e.g., a 4-day exposure reduced to 1-laser flash. Scattering measurements taken in succession with this method can be used to follow time-dependent processes such as crystallization rates, orientation relaxation, annealing, and changes accompanying dynamic strain. R.C.M.

N63-11571 Los Alamos Scientific Lab., N. Mex.
DETONATION PROPERTIES OF CONDENSED EXPLOSIVES CALCULATED WITH AN EQUATION OF STATE BASED ON INTERMOLECULAR POTENTIALS
Wildon Fickett Dec. 14, 1962 172 p 64 refs
(Contract W-7405-eng-36)
(LA-2712) OTS: $2.75

The best available statistical-mechanical theories consistent with a reasonable expenditure of computer time are used to calculate a detonation product equation of state for condensed explosives and are tested by comparison of calculated detonation properties with experiment. Chemical equilibrium among up to nine product species, including a separate solid phase, is assumed. The LJD cell model is the basic equation of state. For application to mixtures, a variant of the Longuet-Higgins conformal solution theory is chosen, although some other forms are also considered. The sensitivity of the results to variation of the uncertain intermolecular potentials and other doubtful elements of the theory is sufficient to rule out an a priori calculation, but rough adjustment of one parameter gives fair agreement with experiment for a variety of CHON explosives. Although some insight into the problem is gained, the performance of this relatively complex theory is comparable to that of simpler forms previously tried. It appears that still more complicated theories and better knowledge of the intermolecular potentials are required for further progress. Author

N63-11572 Los Alamos Scientific Lab., N. Mex.
A PROPOSED MODIFICATION OF THE AVAILABLE MOMENTUM REGION IN THOMAS-FERMI THEORY
John F. Barnes Dec. 11, 1962 150 p 50 refs
(Contract W-7405-eng-36)
(LA-2750) OTS: $2.50

A "quantum correction" of the statistical model of the atom has been obtained by modifying March and Plaskett's region of integration in the (n_r,l), or quantum number, plane. Intergrations over the plane lead, in the unmodified case, to the Thomas-Fermi density expression and energy equation. Integrations over the modified region have here been shown to produce a modified Thomas-Fermi expression for the electron density, and a correction to the kinetic energy. The latter correction shows a similarity to the Weizsäcker correction, but is smaller by a slowly changing factor of the order of ten. A modified Thomas-Fermi-Dirac equation has been derived by the standard variational procedure. Numerical solutions of the equation have been obtained which yield atomic binding energies in much better agreement with experimental values than those of the unmodified theory. The pressure-compression values, however, are but slightly different from those on the unmodified model. Author

N63-11581 Arizona U., Tucson
TEMPERATURE FLUCTUATIONS AT A WETTING FRONT AND AN APPLICATION OF THE THEORY OF RATE PROCESSES TO WATER FLOW IN SOILS Annual Report [September 1, 1961 through August 31, 1962]
Duwayne M. Anderson, Garrison Sposito, Richard Sommerfield, and Roy Street Sept. 1962 49 p 16 refs
(Contract DA-36-039-SC-80581)

Apparent activation energies for movement of water in the liquid and vapor phases were determined for infiltration through a muck soil and Palo Verde sandy loam. The values support the conclusion that unsaturated water movement is essentially a viscous flow process, complicated to some extent by interaction between the moving water and the surfaces of the porous medium. The apparent activation energy value for vapor movement through the muck soil was regarded as evidence that evaporation at the wetting front is the rate-limiting process for movement of the vapor phase. The dependence of maximum temperature rise during infiltration upon initial moisture content of the medium was determined for Arizona bentonite and Palo Verde sandy loam. Magnitude of the temperature rise was found to decrease exponentially with increasing initial moisture content for both media. The results indicated that temperature fluctuations during infiltration are insignificant in soils with water contents above the wilting point. Heat of immersion for Arizona bentonite was determined and shown to decrease exponentially with increasing initial moisture content. The results indicate that heat of vaporization of soil water does not differ appreciably from that of free water in soils under normal field conditions (moisture above the wilting point) but that in soils drier than the wilting point it may be considerably higher. Author

N63-11635 Stanford U. Inst. of Theoretical Physics, Calif.
THE SYMMETRIZED MANY-CHANNEL ND^{-1} METHOD AND THE POLE APPROXIMATION
Arthur W. Martin June 1962 11 p 4 refs Submitted for Publication
(Contract AF 49(638)-388)
(Tech. Note 59; AFOSR-TN-2566)

The many-channel ND^{-1} technique in dispersion relations, proposed by Bjorken, has been reformulated in a way which automatically insures the symmetry of the scattering matrix. The usefulness of this new representation is discussed, and it is shown that the representation allows the solution to the many-pole approximation problem to be written down by inspection. Possible applications of this solution to physical problems are indicated. Author

N63-11636 Stanford U. Inst. of Theoretical Physics, Calif.
UNITARITY AND HIGH ENERGY INELASTIC SCATTERING
M. Baker and R. Blankenbecler June 1962 27 p 9 refs
(Contract AF 49(638)-388)
(Tech. Note 60; AFOSR-TN-2640)

The effect of approximately enforcing the unitarity requirement on peripheral collision-type approximations is discussed. A matrix formulation of the Fourier-Bessel representation of the scattering amplitude is utilized which automatically satisfies unitarity at high energies. Results indicate that quantitative agreement of the peripheral collision approximation with experiment can be accidental, since the corrections due to unitarity take the same form and magnitude as the phenomenonological form factors, depending only on the momentum transfer, which are introduced to account for "off-mass-shell" effects. Three models are discussed; one of them has the behavior characteristics of a Regge trajectory. Author

N63-11637 Stanford U. Inst. of Theoretical Physics, Calif.
QUANTIZATION OF A SELF-COUPLED BOSON FIELD
L. I. Schiff June 1962 10 p 1 ref
(Contract AF 49(638)-388)
(Tech. Note 65; AFOSR-TN-2941)

A new method is proposed for the quantization of self-coupled boson fields. The field is analyzed in terms of Hermitian amplitudes of an expansion in plane waves, and the wave function of the system is expressed in terms of these amplitudes. The field Hamiltonian then

becomes a differential operator. The variational method is applied, using a trial function that consists of products of arbitrary functions of the mode amplitudes that refer to equal and opposite momenta. Explicit expressions for the vacuum, one-particle, and two-particle states are obtained, and the rest mass and coupling constant are renormalized. There is only S wave scattering in this approximation, and there can be an S wave bound state of two particles if the renormalized coupling constant is sufficiently large and negative. Author

N63-11640 Argonne National Lab., Ill.
PHYSICS DIVISION SUMMARY REPORT [Informal Progress Report, Feb.-Mar. 1962]
Morton Hamermesh et al Mar. 1962 86 p refs
(Contract W-31-109-eng-38)
(ANL-6517)

Preliminary data and results are reported for the following projects: determination of the lifetime distributions of neutrons in glass scintillation neutron detectors; determination of the scattering probabilities of neutrons in thin plates; investigation of the gamma-ray spectrum resulting from thermal neutron capture using a bent crystal spectrometer; modification of the Mark II atomic beam machine; study of the influence of molecular weight and residual styrene monomer concentration on the fluorescence spectra and lifetimes of polystyrene samples; the attempt to prepare CH_2 radicals and measure their appearance potential in a mass spectrometer; study of the dynamics of nuclear collective motion; determination of the scattering of alpha particles by a vibrational nucleus; quantization of the magnetic flux through a superconducting ring; and explanation of characteristic features of the elastic nucleon-nucleon scattering at high energies and small angles on the basis of double diffraction scattering of a virtual boson by the two nucleons. M.P.G.

N63-11642 Queen's U., Belfast (Gt. Brit.)
RESONANCE CHARGE TRANSFER BETWEEN H(is) AND H^+ USING AN APPROXIMATION BASED ON AN EXPANSION IN MOLECULAR EIGENFUNCTIONS. SHORT TITLE: CHARGE TRANSFER—MOLECULAR EIGENFUNCTION APPROXIMATION
A. F. Ferguson [1962] 19 p 13 refs
(Contract N62558-2637; Proj. DEFENDER)

The cross section for the process $H^+ + H(is) \rightarrow H(is) + H^+$ has been calculated for proton energies between 1 and 50 Kev using the perturbed stationary-state approximation, with allowance for momentum transfer effects. Allowance for momentum transfer is found to decrease the cross section by 5% at 2 Kev, by 16% at 5 Kev, and by 45% at 20 Kev. For energies below about 20 Kev, the calculations are within 5% of those of McCarroll (1961), who uses an approximation based on atomic eigenfunctions. The results are in satisfactory accord with the experimental data of Fite et al. (1960) in the lower part of the energy range covered (where capture into excited states is unimportant). Author

N63-11643 Queen's U., Belfast (Gt. Brit.)
DISTORTION APPROXIMATION TO CROSS SECTIONS FOR EXCITATION OF ls-2p TRANSITION OF HYDROGENIC IONS BY BARE NUCLEI
D. R. Bates [1962] 7 p 3 refs
(Contract N62558-2637; Proj. DEFENDER)

The distortion approximation of Bates is applied to the study of inelastic collisions between charged atomic systems. The cross section is computed for the excitation of the ls to 2p hydrogen ion transition by bare nuclei. Curves plotted from this data tend to a limit as L_i/L_p approaches infinity. R.C.M.

N63-11665 Hanford Atomic Products Operation, Richland, Wash.
RESEARCH AND DEVELOPMENT ACTIVITIES IN THE RADIOLOGICAL SCIENCES Physical Sciences Portion, January through December 1961
R. L. Junkins and J. E. Brown, eds. January 15, 1962 308 p 9 refs
(Contract AT(45-1)-1350)
(HW-73337) OTS: $4.00

This report covers material in the following fields: atmospheric physics, radiological physics, and radiological chemistry. J.R.C.

N63-11672 Technical Research Group, Syosset, N.Y.
RESONANCES OF THE FABRY-PEROT LASER Scientific Report No. 1
S. R. Barone Oct. 1962 64 p 7 refs
(Contract AF 19(604)-8817)
(AFCRL-62-778)

The optical mode structure of a Fabry-Perot interferometer-resonator composed of two infinite strip mirrors is investigated from the general theory of nonspectral resonances. It is shown that the classical description of this configuration is inadequate to describe its response to highly monochromatic LASER radiation and must be supplemented by a discussion of the transverse resonance behavior. This introduces a fine structure to the classical Fabry-Perot rings, and implies a discrete resonance behavior for the Fabry-Perot interferometer. In analogy to the characterization of quantum mechanical virtual levels by wave functions and complex energies, it is convenient to characterize the discrete resonances of a Fabry-Perot by mode functions and complex resonant frequencies. It is shown that, in the high-frequency limit, the open sides of the structure can be replaced by an effective impedance boundary condition. The solution of an elementary resonance problem then yields analytic approximations for the mode shapes, characteristic oscillation frequencies, and modal lifetimes. In the common domain of validity, these results are in excellent agreement with previous numerical work on this problem. Author

N63-11676 Joint Publications Research Service, Washington, D.C.
MAGNETIC ELEMENTS
V. V. Kobelev et al June 12, 1962 342 p 51 refs Transl. of the book "Magnitnyye Elementy" Moscow, Inst. of Precision Mech. and Calculation Technol. of the Acad. of Sci. USSR, 1960 313 p
Collection of articles written between 1956 and 1959

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8. OPERATING REGISTER USING MAGNETOSTRICTIVE DELAY LINES Yę. F. Berezhnoy p 169-213 3 refs
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10. MAGNETIC MEMORY DEVICE WITH DIFFERENTIATORS ON RIBBON CORES V. V. Bardizh, Yu. I. Vizun, and V. V. Kobelev p 226-242 2 refs

11. MAGNETOSTRICTIVE-DELAY-LINE STORAGE UNIT WITH INTERMEDIATE READOUT OF CODE Ye. F. Berezhnoy p 243-284 7 refs
12. ADAPTING TRANSFLUXORS IN MEMORY AND PERMANENT STORAGE DEVICES S. V. Bachin p 285-307 7 refs
13. PROBLEMS OF DESIGNING MAGNETIC PERMANENT STORAGE DEVICES Yu. I. Vizun p 303-333 7 refs
14. SUPPLEMENT TO THE ARTICLE OF V. M. KOBELEV, "AN OSCILLOGRAPHIC INSTALLATION FOR DETERMINING HYSTERESIS LOOPS OF SMALL FERRITE CORES" p 334-338

N63-11681 United Nuclear Corp. Development Div., White Plains, N.Y.

REVISED CROSS SECTIONS FOR NEUTRON INTERACTIONS WITH OXYGEN AND DEUTERIUM Final Report

M. H. Kalos, H. Goldstein, and J. Ray Edgewood Arsenal, Md., Nuclear Defense Lab., Aug. 31, 1962 22 p 14 refs
(Contract DA18-108-CML-7156)
(NDL-TR-40)

A revision of the data for angular distributions for elastic neutron scattering in oxygen and deuterium is presented. The kinetics of the (n,2n) reaction in deuterium is discussed, and a Monte Carlo scheme for generating the energy and direction of secondary neutrons is given. Complete sets of the cross sections for both materials are tabulated. Author

N63-11730 Oak Ridge National Lab., Tenn.

NUCLEON-MESON CASCADE CALCULATIONS: TRANSVERSE SHIELDING FOR A 45-Gev ELECTRON ACCELERATOR (PART I)

R. G. Alsmiller, Jr., F. S. Alsmiller, and J. E. Murphy Jan. 11, 1963 111 p 20 refs
(Contract W-7405-eng-26)
(ORNL-3289)

Using a straight-ahead approximation, a set of coupled integro-differential transport equations which describe a nucleon-meson cascade is given. In order to carry out calculations, the necessary physical information concerning high-energy interactions has been extracted from cosmic-ray data by introducing many *ad hoc* assumptions. The equations, and the IBM-7090 code which solves them numerically, may be used for high-energy shielding calculations. Author

N63-11734 Bureau of Mines. Berkeley Thermodynamics Lab., Calif.

LOW-TEMPERATURE HEAT CAPACITIES AND ENTROPIES AT 298.15° K OF MONOMOLYBDATES OF SODIUM, MAGNESIUM, AND CALCIUM

W. W. Weller and E. G. King 1963 10 p refs
(BM-RI-6147)

Low-temperature heat-capacity measurements were conducted, and entropies at 298.15° K were evaluated for sodium monomolybdate (Na_2MoO_4), magnesium monomolybdate ($MgMoO_4$), and calcium monomolybdate ($CaMoO_4$). The 298.15° K entropy values were sodium monomolybdate, 38.1±0.3 cal/deg mole, magnesium monomolybdate, 28.4±0.2 cal/deg mole, and calcium monomolybdate, 29.3±0.2 cal/deg mole. Author

N63-11754 Oak Ridge National Lab., Tenn.

NEUTRON PHYSICS DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING SEPTEMBER 1, 1962

E. P. Blizard, A. D. Callihan, and F. C. Maienschein Jan. 11, 1963 325 p refs
(Contract W-7405-eng-26)
(ORNL-3360) OTS: $4.00

This report covers the following: research for light-water-moderated reactors; radiation detector studies; experimental and theoretical studies; reactor shielding; shielding against high-energy radiation; measurement of secondary nuclear particles from the interactions of high-energy protons; and desalination studies. J.R.C.

N63-11763 Avco Corp. Defense and Industrial Products Group, New London, Conn.

UNDERWATER SOUND TRANSMISSION

H. W. Marsh and M. Schulkin Nov. 1962 107 p 132 refs
(Supported by ONR)

A physical representation of the ocean is presented, together with constants and equations sufficient to permit a reasonable calculation of the average sound field. The state of knowledge concerning underwater sound transmission is reviewed, and a proposed oceanographic acoustic description of the physical environment of underwater sound is outlined. A quantitative model for the proposed description is developed, and detailed methods are given for computing the average sound field. The aspects of the sound field which are not covered by the quantitative model are discussed, e.g., mean variability, fluctuations, and turbulence effects. Recommendations are made for the direction of future research in underwater sound propagation. R.C.M.

N63-11765 European Atomic Energy Community, Brussels (Belgium)

LES ACTIVITÉS DU GROUPE DE TRAVAIL "DOSIMÉTRIE" D'EURATOM [THE ACTIVITIES OF THE EURATOM DOSIMETRY WORKING GROUP]

P. Delattre (CEA-CEN Saclay) and A. Prosdocimi (EURATOM-BCMN Geel) Groupe de Travail "Dosimetrie dans les Piles", [Dec.] 1962 22 p In French; English summary Presented at the Colloquy on Detection, Dosimetry and Standardization of Neutrons, organized by the International Atomic Energy Agency, Harwell, Dec. 10-14, 1962
(EUR-88.f) Available from Belgian American Bank and Trust Co., N.Y., account No. 121.86: 30 Belg. Fr.

The EURATOM Dosimetry Working Group was set up in October 1960 with the aim of facilitating and fostering the exchange of information between the countries of the European Community on all aspects of the measurement of nuclear radiation in research piles.

The main functions of the Dosimetry Group are: to develop various methods for measuring (and possibly calculating) nuclear radiation in research piles; to do all in its power to promote standardization of these methods within the countries of the European Community; to endeavor to obtain distribution of work between the various laboratories concerned in such a way as to avoid useless duplication of effort and thus to ensure rapid completion of the work. The situation is set out about the integration of thermal neutron flux, the methods applicable to intermediate energies, the threshold detectors used for fast neutron flux. Moreover the techniques of gamma dose determination are reviewed. Author

N63-11770 Watertown Arsenal. Materials Research Lab., Mass.

THERMODYNAMICS OF INTERSTITIAL SOLID SOLUTIONS WITH REPULSIVE SOLUTE-SOLUTE INTERACTIONS

Kenneth A. Moon Dec. 1962 23 p 21 refs
(MRL-127)

The quasi-chemical treatment, published in 1937, by Locher is recommended as the best available statistical treatment of interstitial solutions. It is shown that the quasi-chemical method is exact in certain important cases, and the error in other cases is discussed. An

expression for the excess entropy of interstitial solutions with excluded sites is derived from the quasi-chemical expression. The conditions of reliability of this expression, and of other simplified treatments which have previously appeared in the literature, are evaluated by comparison with the quasi-chemical result. An analysis is given of the excess partial entropy of hydrogen in V-H, Nb-H, and Ta-H solutions. Author

N63-11774 Brown U. Metcalf Chemical Labs., Providence, R.I.
THE VISCOSITY OF NITROGEN, HELIUM, NEON, AND ARGON FROM -78.5° TO 100° C BELOW 200 ATMOSPHERES
G. P. Flynn, R. V. Hanks, N. A. Lemaire, and J. Ross Virginia U., Charlottesville, School of Eng. and Applied Sci., Nov. 1962 48 p 46 refs Submitted for Publication
(Contract Nonr-3623(00); Proj. Squid)
(Tech. Rept. BRN-3-P)

A new capillary-flow viscometer has been developed for the measurement of the absolute viscosity of gases as a function of temperature and pressure. In the viscometer a steady flow of gas is maintained through a capillary of known dimensions, and the pressure difference developed across the capillary is measured as a function of the flow rate. From these measurements there are obtained by extrapolation to zero flow rate the absolute viscosity and information on the deviation from Poiseuille flow. The viscosities of nitrogen, helium, neon, and argon have been determined in this viscometer from -78.5 (-50 for helium and neon) to 100° C and up to 200 atm. The experimental results are believed to be accurate within 0.1%. Agreement with previous results, where available, is generally satisfactory. All the viscosity data for each gas can be represented adequately by the sum of two functions, one dependent on temperature only, the other dependent on density only. Author

N63-11796 California U., Berkeley. Lawrence Radiation Lab.
THE LOW-TEMPERATURE HEAT CAPACITY OF TIN AND INDIUM
Harry Roger O'Neal (Ph. D. Thesis) Jan. 1963 72 p 38 refs
(Contract W-7405-eng-48)
(UCRL-10426) OTS: $1.75

The heat capacity of indium was measured from 0.08° K to 4.2° K, and that of tin from 0.09° K to 1.2° K. The results on indium show that below about 0.7° K the total superconducting-state heat capacity is less than the normal-state lattice heat capacity alone. This result is surprising compared with analyses of the heat-capacity data of a superconductor made in the usual way. However, the effect was not observed in tin. Comparisons with other pertinent experiments are made, and two proposed explanations of the effect are discussed. Author

N63-11805 Hanford Atomic Products Operation, Richland, Wash.
IN-REACTOR MONITORING OF ZIRCALOY-2 PRTR PRESSURE TUBES. PART II, MAY AND JUNE 1962
D. R. Doman and P. J. Pankaskie Aug. 1962 25 p 3 refs
(Contract AT(45-1)-1350)
(HW-74731, Pt. II) OTS: $0.75

A surveillance testing program was established for the Zircaloy-2 pressure tubes of the Plutonium Recycle Test Reactor (PRTR) because this application is one of the first high-temperature uses of Zircaloy-2 as a load-bearing structural material. Both in-reactor monitoring and pre- and post-irradiation tests were conducted. Fretting marks were found on all 85 pressure tubes examined, and in most cases these marks were attributable to spiral-wire bundle wraps; however, no creep has occurred in the tubes and satisfactory gas gaps are being maintained. Although the pressure-containing capacity of the tubes is still satisfactory because of radiation strengthening of the Zircaloy, these results indicate a need to redesign the fuel elements to eliminate spiral bundle wraps and provide larger spacer contact areas. M.P.G.

N63-11806 Maryland U. Inst. for Fluid Dynamics and Applied Mathematics, College Park
NEW TECHNIQUES FOR THE VACUUM-ULTRAVIOLET
T. D. Wilkerson and R. Lincke Dec. 1962 11 p 14 refs
(NASA Grant NsG-283-62; NSF Grant GP-16; Contracts AF 49(638)-401 and AF 19(628)-269)
(BN-307)

Methods are discussed for improving radiation measurements in the vacuum ultraviolet. The wavelength range considered is 500Å to 1500Å, corresponding to a photon energy range of 8 to 25 electron volts. The sensitivity range of the photo-emission-scintillation detector which has a 1400Å cutoff is limited to a minimum of 1050Å by preceding the detector with a lithium-fluoride window. This range of 1050Å to 1400Å is interesting to isolate because it contains the resonance lines of atomic species such as C II, N I, H I, and A I. A simple detector which responds to wavelengths below 800Å was made by mounting a disk of microcrystalline sodium salicylate coated with 1200Å of aluminum on the end of a standard photomultiplier. With this detector, the He I resonance line (584Å) can be studied with very little interference from the overlapping Lyman-α region. R.C.M.

N63-11816 Du Pont de Nemours (E. I.) and Co. Savannah River Lab., Aiken, S.C.
CONTAMINATION AND DECONTAMINATION OF LOW TEMPERATURE, WATER-COOLED REACTORS. PART II: DEPOSITION OF RADIONUCLIDES ON ALUMINUM FROM SOLUTIONS
Anton B. Carlson Oct. 1962 19 p 14 refs
(Contract AT(07-2)-1)
(DP-788) OTS: $0.50

The deposition from aqueous buffer systems of dissolved Co^{60}, Cr^{51}, Ru^{106}-Rh^{106}, and Zr^{95}-Nb^{95} on aluminum surfaces was investigated at 25° C. This work, part of a decontamination studies program, shows that the direct deposition of dissolved radionuclides in the oxide lattice is an important mechanism by which aluminum fuel assemblies become contaminated. Deposition is minimum where the corrosion rate of aluminum is minimum. Author

N63-11817 Du Pont de Nemours (E. I.) and Co. Atomic Energy Div., Wilmington, Del.
HEAVY WATER MODERATED POWER REACTORS Progress Report, Oct. 1962
L. Isakoff and H. F. Measley, comps. Nov. 1962 41 p 56 refs
(Contract AF(07-2)-1)
(DP-795) OTS: $1.00

The Heavy Water Components Test Reactor (HWCTR) was started with test-fuel elements. A new design of driver elements was proposed for use in later loads of HWCTR to obtain more severe thermal conditions than can be obtained in the test elements with the current design of driver tubes. Additional measurements of heat-transfer burnout in annuli and tubes containing boiling water at 1000 psia were made at the Savannah River Laboratory. Author

N63-11818 Du Pont de Nemours (E. I.) and Co. Savannah River Lab., Aiken, S.C.
PROCESSING OF POWER REACTOR FUELS Twentieth Quarterly Progress Report, July 1 to Oct. 1, 1962
J. Harding Owen, comp. Dec. 1962 16 p 4 refs
(Contract AT(07-2)-1)
(DP-811) OTS: $0.50

Cermet fuel assemblies of the APPR type were successfully dissolved in the semiworks electrolytic dissolver; a nonconducting basket of NEMA Grade G-7 plastic held the fuel during dissolution. Stray-current corrosion of the stainless steel dissolver vessel was eliminated by shielding the anode from the vessel. Author

N63-11819 Los Alamos Scientific Lab., N. Mex.
MOLTEN PLUTONIUM PUMP EXPERIMENT
J. E. Deverall and G. L. Caldwell Dec. 24, 1962 91 p
(Contract W-7405-eng-36)
(LA-2761) OTS: $2.00

The Molten Plutonium Pump Experiment was a subcritical mock-up of a reactor core in which a plutonium-iron alloy was circulated by means of a sodium lift pump. Sodium for the lift pumping was circulated by an E.M. pump in an isothermal loop at 500° C. The purpose of the test was to study pump characteristics, instrumentation, sodium-fuel separation, and fuel-transfer systems. Operational characteristics of the core and fuel-transfer system were observed by a closed, gamma-ray television circuit, radiographs, and a fuel reservoir-level indicator. Author

N63-11820 Los Alamos Scientific Lab., N. Mex.
QUARTERLY STATUS REPORT ON LAMPRE PROGRAM FOR PERIOD ENDING NOVEMBER 20, 1962
Dec. 26, 1962 18 p
(Contract W-7405-eng-36)
(LAMS-2815) OTS: $0.50

The system modifications to reduce reactor cell temperatures to acceptable values appear to have been successful, and routine operation of LAMPRE I (Core II) at 1 MW was initiated. While the reactor was at 1 MW power level, a rapid loss of reactivity was observed. Because of a leak occurring in a fuel capsule, the reactor was shut down. After the defective capsule was removed for examination, operation was resumed with a temporary limitation on the power level of 500 KW. The LAMPRE control elements proved to be satisfactory. Scram time for four control rods appears to be constant to within 0.01 sec for all operating conditions, and the shim rundown time during a scram is also satisfactory. B.J.C.

N63-11828 California Research Corp., Richmond
RADIATION STABILITY OF ORGANIC FLUIDS Progress Report No. 17, Apr. 1 to June 30, 1962
R. O. Bolt, M. L. Burrous, J. G. Carroll, K. L. Hall, M. A. Sweeney, and W. W. West Washington, AEC Div. of Tech. Information, Sept. 21, 1962 45 p 6 refs
(Contract AT(04-3)-248)
(TID-16999) OTS: $1.00

Preliminary results from the Susie program confirm that there is a fast neutron effect in polyphenyls. Furthermore, radiation stability depends on temperature and on high boiler content. Qualitatively, G_{-M} (molecules destroyed/100 ev absorbed) is higher for neutron-rich than for gamma-rich irradiations. G_{-M} is lower for higher conversion and increases with higher irradiation temperature. Results of extensive radiation monitoring in the neutron-rich facility indicate that the Susie neutron spectrum is very close to a Cranberg (fission) spectrum for energies greater than 1 Mev. Thus, the Cranberg spectrum is a good approximation for calculating the energy absorption integral. In this facility, about 95% of the energy absorbed is from the slowing down of fast neutrons. Organic coolants were irradiated in the Susie reactor between August 1961 and June 1962. All capsule irradiations and radiation monitoring operations are complete. Author

N63-11830 European Atomic Energy Community, Brussels (Belgium)
STUDIO DI UN DETETTORE DI NEUTRONI TERMICI PER DETERMINARE LA DISTRIBUZIONE DEL FLUSSO IN UN FASCIO COLLIMATO [STUDY OF A THERMAL NEUTRON DETECTOR TO DETERMINE FLUX DISTRIBUTION IN A COLLIMATED BEAM]
G. Fraysse and A. Prosdocimi Central Bureau for Nuclear Measurements, Geel Establishment (Belgium), Nov. 1962 23 p 6 refs In Italian; English summary
(EUR-133.i) Available from Belgian American Bank and Trust Co., N.Y., account No. 121.86: 30 Belg. Fr.

Boron- and lithium-loaded scintillators for thermal neutrons are investigated. Their behaviors are determined throughout the study of pulse shape, light efficiency, and thermal neutron and gamma sensitivity. Because of its satisfactory neutron efficiency and resolution, the lithium scintillator was used to equip a probe. An application is made by tracing the neutron-flux space distribution of a beam coming out of a reactor. Author

N63-11858 Air Force Cambridge Research Labs. Geophysics Research Directorate, Bedford, Mass.
TABLES OF THE BLACKBODY RADIATION FUNCTION FOR WAVENUMBER CALCULATIONS Research Report
Russell G. Walker Sept. 1962 182 p
(AFCRL-62-877)

Tables of the Planck Radiation function are presented in terms of the spectral radiance (watts/cm^2 ster cm^{-1}) of a blackbody as a function of the wavenumber of the radiation. Values of the spectral radiance are tabulated for the temperature range 77° K to 30,000° K over the wavenumber range 50 to 37500 cm^{-1}. Author

N63-11864 Michigan U. Inst. of Science and Tech., Ann Arbor
OPTICAL SPATIAL FILTERING TECHNIQUES Interim Engineering Report, Fourth and Fifth Quarters, 1 April through 30 September 1962
A. B. Vander Lugt and F. Rotz Jan. 1963 36 p
(Contract AF 33(616)-8433)
(Rept. 4594-19-P)

This report gives the results of a continuing program to evaluate the usefulness of spatial filtering techniques in detecting and identifying signals. Whereas complex filtering techniques had been applied in only one dimension in the past, an example of two-dimensional filtering is presented in this report, and shown to increase the signal-to-noise ratio as expected. A study relating the signal shape to the rotational correlation function of the signal was undertaken as the preliminary step in determining the optical system's ability to distinguish between two signals with different orientations. Experimental tests show that for a certain class of signals the rotational correlation function produced by the system agrees fairly well with the theoretical predictions. Another study shows how a modified Mach-Zehnder interferometer can be used to determine the phase distribution in the spectrum of an arbitrary distribution of light. A example is given to support the theory. Author

N63-11865 Rochester U., N.Y.
PARASTATISTICS: EXPERIMENTAL SUGGESTIONS; CONNECTION WITH SPIN AND TCP THEOREM FOR A GENERAL FIELD THEORY
G. F. Dell'Antonio (Naples U.), O. W. Greenberg (Maryland U.), and E. C. G. Sudarshan (Inst. Math. Sci. (India)) July 31, 1962 Submitted for Publication
(Contract AT(30-1)-875)
(NYO-10241)

A study is made of the connection of parastatistics and spin, and TCP (time inversion, charge conjugation, and parity operations) theorem, for a general field theory. Properties of relativistic quantum field theories which do not depend on locality hold as well for parastatistic fields as for bose or fermi fields. It is shown that the assumption of paralocality leads to weak local and antilocal commutativity of all vacuum expectation values for parabose or parafermi fields, and thus to a generalization of the TCP theorem for paralocal fields. The connection between spin and statistics, for a choice between parabose and parafermi statistics, shows that integral spin fields must obey parabose, and odd-half-integral spin fields must obey parafermi statistics. J.R.C.

N63-11866 General Dynamics/Astronautics. Space Science Labs., San Diego, Calif.

LOW ENERGY ELASTIC AND INELASTIC COLLISION OF ELECTRONS AND MOLECULES WITH NEUTRAL PARTICLES Annual Report, 1 January 1962 to 31 December 1962

Roy H. Neynaber, Erhard W. Rothe, et al Dec. 31, 1962 45 p 71 refs

(Contract Nonr-3674(00))

(AE63-0006)

CONTENTS:

1. SCATTERING OF THERMAL RARE GAS BEAMS BY ARGON. INFLUENCE OF THE LONG-RANGE DISPERSION FORCES E. W. Rothe, L. L. Marino, R. H. Neynaber, P. K. Rol, and S. M. Trujillo Repr. from Phys. Rev., v. 126, no. 2, Apr. 15, 1962 p 598-602 24 refs
2. SLOTTED-DISK VELOCITY SELECTOR OF EXTENDED RANGE S. M. Trujillo, P. K. Rol, and E. W. Rothe Repr. from Rev. Sci. Instr., v. 33, no. 8, Aug. 1962 p 841-843 4 refs
3. ELECTRON IMPACT IONIZATION OF ATOMIC NITROGEN A. C. H. Smith, E. Caplinger, R. H. Neynaber, E. W. Rothe, and S. M. Trujillo Repr. from Phys. Rev., v. 127, no. 5, Sept. 1, 1962 p 1647-1649 9 refs
4. VELOCITY DEPENDENCE OF THE TOTAL CROSS SECTION FOR THE SCATTERING OF Li AND K BY Xe E. W. Rothe, P. K. Rol, S. M. Trujillo, and R. H. Neynaber Repr. from Phys. Rev., v. 128, no. 2, Oct. 15, 1962 p 659-662 19 refs
5. VELOCITY DEPENDENCE OF THE TOTAL CROSS SECTION FOR ATOM-ATOM SCATTERING AT THERMAL ENERGIES P. K. Rol and E. W. Rothe Repr. from Phys. Rev. Letters, v. 9, 1962 p 494 4 refs
6. LOW-ENERGY ELECTRON SCATTERING FROM ATOMIC NITROGEN R. H. Neynaber, L. L. Marino, E. W. Rothe, and S. M. Trujillo [1962] 13 p 11 refs Submitted for Publication

N63-11867 Army Missile Command. Physical Sciences Lab., Redstone Arsenal, Ala.

RADIATIVE TRANSITION PROBABILITIES AND ABSORPTION OSCILLATOR STRENGTHS FOR THE ALKALI-LIKE IONS OF THE ALKALINE EARTHS AND FOR CALCIUM I

T. G. Roberts and W. L. Hales Oct. 23, 1962 39 p 24 refs

(AMC-RR-TR-62-8)

The radiative transition probabilities and absorption oscillator strengths for the alkali-like ions of the alkaline earths have been calculated by using the central field approximation of Bates and Damgaard. The radiative transition probabilities and f values were also calculated for Calcium I. The calculated f values for Calcium I are compared with the experimental f values which were measured by Ostrovskii and Penkin, and by Olsen, Routly, and King. This comparison showed that, even for complex atomic systems, the central field approximation of Bates and Damgaard yields reasonably accurate relative f values. The transition probabilities and f values which were calculated for cesium by Heavens using the method of Bates and Damgaard and by Stone using a different method are compared with each other and with the few existing experimental f values for Cesium I. Author

N63-11868 Stanford U. Stanford Linear Accelerator Center, Calif.

SHOWER DEVELOPMENT AND HEATING IN THE WAVEGUIDE STRUCTURE WITH AN 800 MEV ELECTRON BEAM

J. K. Cobb and J. J. Muray July 1962 38 p 2 refs

(Contract AT(04-3)-400)

(SLAC Rept. 3) OTS: $1.00

Temperature measurements along the axis of the Mark III Linear Accelerator were made to provide information about the radial development of the shower and the heat conduction properties of the waveguide. A beam of electrons (800 Mev) from the Mark III Linear Accelerator was allowed to impinge on the first disk of a disk-loaded copper, water-cooled accelerator section. This structure had probe-type thermistors inserted in the disks and attached to the outer skin of the waveguide section. These thermistors were used to measure the temperature change of the waveguide structure as a function of the axial position. Two different beam currents were used and a water flow of 1.0 gallon per minute was maintained throughout the run. The temperature difference between the hot (beam impinging) values and the cold (no beam) values was obtained by applying the resistance change of the thermistors to their individual characteristics and obtaining the equivalent temperature change. The average beam currents were: $I_1 = 0.554$ μ amp and $I_2 = 1.308$ μ amp. The beam energy measured by a calibrated deflection magnet was 800 Mev. A formula is presented for calculating the temperature difference between the inside and outside surfaces of the first waveguide disk. The radial development of the shower can be calculated by correcting the temperature difference for the water heating effect. I.v.L.

N63-11869 Stanford U. Stanford Linear Accelerator Center, Calif.

ADIABATIC APPROXIMATION FOR DYNAMICS OF A PARTICLE IN THE FIELD OF A TAPERED SOLENOID

R. H. Helm Aug. 1962 20 p 1 ref

(Contract AT(04-3)-400)

(SLAC Rept. 4) OTS: $0.50

A longitudinal-magnetic field whose strength varies slowly in the longitudinal direction is a potentially useful device for guidance and phase-space transformations of particle beams. The theory of such devices usually is developed on the assumption of particles having no angular momentum. However, it seems worthwhile to examine the more general case where finite angular momenta are allowed. In particular, the more general theory is needed to predict the transmission or effective solid angle in the presence of a finite extent in transverse phase space. In the present paper the equations of motion are integrated in the WKB or adiabatic approximation, and the results are given in terms of a transfer matrix from the initial to the final transverse (Cartesian) dynamical coordinates. The validity conditions for the approximation are discussed. An adiabatic invariant function of the transverse dynamical coordinates is developed. This function defines a closed surface in phase space (admittance surface) whose volume is invariant; consequently, it is useful in problems involving phase-space transformations and matching and in predicting the transmission of the system. The conclusion remains, of course, that the limits of validity of the theory should be checked by numerical integration of the equations of motion before any design on adiabatic theory is adopted. Author

N63-11870 Stanford U. Stanford Linear Accelerator Center, Calif.

THE PRINCIPLE OF DESIGN OF MAGNETIC MOMENTUM SLITS

E. L. Chu and J. Ballam Oct. 1962 40 p refs

(Contract AT(04-3)-400)

(SLAC Rept. 6) OTS: $1.00

Design criteria are presented for both the iron-core and the air-core types of momentum slits. These magnetic devices separate the particles that are in a very narrow momentum range from the rest of the particles in a beam. The particles in the desired momentum range enter the central part of the slit where there is no magnetic field and travel the length of the slit without being deflected. Particles with higher or lower momentum enter the slit on either side of the field-free region where they are continuously deflected by the polarity of a transverse magnetic field. Ideally, these slits should be designed without intersecting fields or material obstructions to avoid heating, radioactivity, and scattering; in practice, corrective systems of surface currents are indicated for air-core and iron-core slits. Detailed calculations representing the aperture field in terms of multipoles, the superposition of multipole fields, and the elimination

of several lower-order terms are presented. Two integral equations are derived for designing iron core momentum slits; these should also be useful for calculating the fringing fields in other types of d.c. magnets. M.P.G.

N63-11875 Columbia U., New York, N.Y.

A GENERALIZATION OF THE CONSTITUTIVE EQUATIONS OF LINEAR VISCOELASTICITY Technical Report No. 17

M. P. Bieniek Nov. 1962 41 p 17 refs
(Contract Nonr-266(78))
(CU-17-62-ONR-266(78)-CE)

A review is presented of kinematical and dynamical variables of state for a viscoelastic median subjected to large deformations. Certain constitutive equations are given in the forms of the simplest generalizations of the equations of linear viscoelasticity. Their application to two cases of relaxation is outlined. Author

N63-11904 Industrial Science and Technology Agency. Electrotechnical Lab., Tokyo (Japan)

DIFFUSION MAGNETIC AFTER EFFECT AND THE ACCOMPANYING PHENOMENA IN SUBSTITUTIONAL FERROMAGNETIC ALLOYS

Takaaki Yamamoto June 1962 99 p 69 refs In Japanese; English summary
(*Its* Researches No. 628)

This paper deals with the relaxation phenomena of magnetic characteristics due to diffusion aftereffect in substitutional ferromagnetic alloys and the accompanying phenomena. Special attention is paid to the f.c.c. Ni-Co alloy system with no order-disorder transformation. Author

N63-11928 Beers (Roland F.) Inc., Alexandria, Va.

SUMMARY OF PREDICTIONS AND COMPARISON OF OBSERVED EFFECTS OF GNOME ON PUBLIC SAFETY Final Report

May 31, 1962 20 p
(Proj. Gnome)
(PNE-128F) OTS: $0.50

A review of segments of Project GNOME, relating to the measurements of ground motion, is presented. The segments discussed are: the procedure for predicting amplitudes of ground motion in halite, comparison of observed and predicted values of ground motion at surface zero, separation of layers at interfaces, and generalized predictions at intermediate range. The results of these studies are as follows: (1) comparisons between predicted values of particle velocity, together with observed values of the radial component as determined by measurements in subsurface bore holes in halite, show that satisfactory agreement was found between predicted and observed results; (2) an equation of state was determined by the physical properties of the medium under shock-wave excitation, which obviates the necessity of establishing theories on the detailed mechanism of propagation of wave energy from the nuclear detonation in halite. D.B.

N63-11937 Bettis Atomic Power Lab., Westinghouse Electric Corp., Pittsburgh, Pa.

BETTIS TECHNICAL REVIEW: REACTOR TECHNOLOGY

Dec. 1962 95 p 37 refs
(Contract AT-11-1-GEN-14)
(WAPD-BT-27) OTS: $2.25

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3. THE IRRADIATION BEHAVIOR OF ZrO_2-UO_2 FUELS B. F. Rubin and R. M. Berman p 37-51 6 refs (See N63-11940 04-23)
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6. CHIC NUMERICAL STUDIES FOR REACTOR THERMAL TRANSIENTS G. Birkhoff, T. F. Kimes, and L. L. Lynn p 73-83 6 refs (See N63-11943 04-13)
7. CALCULATION OF COMPLEX NATURAL MODES FOR SPATIAL XENON OSCILLATIONS AND COMPARISON WITH A SIMPLE APPROXIMATION R. L. Ewen p 85-93 5 refs (See N63-11944 04-20)

N63-11938 Bettis Atomic Power Lab., Westinghouse Electric Corp., Pittsburgh, Pa.

AN INVESTIGATION OF STABILITY IN A GLASS MODEL STEAM GENERATOR

E. J. Mc Gowan and J. R. Bodoia *In its* Bettis Technical Review: Reactor Technology. Dec. 1962 p 1-19 4 refs (See N63-11937 04-23) OTS: $2.25

An investigation of self-induced flow oscillations in a glass model steam generator is described, and oscillation data are presented. The effects of the major controlling parameters on the stability of the model are discussed. In addition, the measured data are compared to the output of a digital computer program which computes the recirculation ratio and system stability in steam generators. Author

N63-11939 Bettis Atomic Power Lab., Westinghouse Electric Corp., Pittsburgh, Pa.

A COMPARISON OF COPRECIPITATION, COEVAPORATION, AND COMMINUTION PROCESSES FOR FABRICATING SINTERED ZIRCONIA-URANIA PLATES

J. C. Clayton, L. Berrin, and B. E. Schaner *In its* Bettis Technical Review: Reactor Technology. Dec. 1962 p 21-36 11 refs (See N63-11937 04-23) OTS: $2.25

As part of the fuel development program for the seed portion of the second core of the Shippingport reactor, several procedures for preparing sinterable solid solution zirconia-urania powders of small particle size were investigated. High-density wafers made from precipitated oxide powders were severely warped. Coevaporation of mixed uranyl-zirconyl salt solutions produced a ZrO_2:UO_2 powder which could be fabricated into high-density plates. Highly sinterable mixed oxide powders were obtained by milling calcined ZrO_2-UO_2 with alloy steel, alumina, and boron carbide grinding media. Author

N63-11940 Bettis Atomic Power Lab., Westinghouse Electric Corp., Pittsburgh, Pa.

THE IRRADIATION BEHAVIOR OF ZrO_2-UO_2 FUELS

B. F. Rubin and R. M. Berman *In its* Bettis Technical Review: Reactor Technology. Dec. 1962 p 37-51 6 refs (See N63-11937 04-23) OTS: $2.25

An investigation was made to determine the irradiation behavior of ZrO_2-UO_2 fuels at high temperatures and high burnups. Fuels having 25% to 46% UO_2 swelled linearly with increasing exposure. Temperature exerted only a slight effect on swelling. The two-phase tetragonal structures homogenized to single phase after short exposure, then stabilized in the metastable cubic structure at higher exposures. The original porosity of the fuel was eliminated at low exposure. Fission gases were precipitated as bubbles, also at low exposures. Author

N63-11942 Bettis Atomic Power Lab., Westinghouse Electric Corp., Pittsburgh, Pa.

A COMPARISON OF A SELF-ADJOINT VARIATIONAL METHOD TO 36-GROUP THERMAL SPECTRUM CALCULATIONS OF HETEROGENEOUS SYSTEMS

S. L. Shufler *In its* Bettis Technical Review: Reactor Technology. Dec. 1962 p 59-72 5 refs (See N63-11937 04-23) OTS: $2.25

A self-adjoint variational principle for the solution of the space-energy thermal spectrum near lumped absorbers is applied to the analysis of one-dimensional heterogeneous arrays. An extensive set of typical fuel-nonfuel-absorber spatial combinations at 70° F and 525° F is analyzed by the variational method (with equivalent single-group constants) and compared with results from the more exact and detailed 36-group thermal spectrum calculations and from the three- and six-group methods. Activation shapes, power peaking factors, and absorption rates of the lumped absorbers, as calculated by the variational principle, are in excellent agreement with the multigroup results. Author

24 PHYSICS, PLASMA

Includes: fusion; and magnetohydrodynamics.

For related information see: 05 Astronomy and Astrophysics; 23 Physics, General; and 25 Physics, Solid-State.

N63-11621 Plasmadyne Corp., Santa Ana, Calif.

RECOMBINATION STUDY USING PLASMA ARC Final Project Report, 2 December 1960 to 2 December 1961

Che-Jen Chen Jan. 5, 1962 58 p 10 refs
(NASA Contract NAS8-844)
(FR-012-844) OTS: $5.60 ph, $1.94 mf

Efforts to experimentally verify or disprove the usual theoretical assumptions made in the descriptions of arc jet flow are described. The wide use of frozen flow, or degree of dissociation independent of temperature, was studied in particular. Experimental results were compared with the theoretical model of Bray, which is based on an ideal dissociating gas and a quasi one-dimensional flow. This model permits passage from frozen flow to complete local equilibrium by changing the parameter of dissociation rate. Measurements of static pressure downstream and spectrographic measurements led to a particular nozzle but, under various conditions, to a consistent denial of frozen flow according to Bray. The experiments on a particular nozzle proved that, with care, pressure measurements and spectrographic measurements along a nozzle were feasible and reliable. The use of a very narrow apex cone and low Reynolds number flow has permitted a good understanding of results. These conditions, however, enhance boundary-layer effects and do not permit good correlation with Bray's free-flow theories. A.S.

N63-11704 Princeton U. Plasma Physics Lab., N.J.

THE DIELECTRIC FUNCTION FOR CLASSICAL MANY-BODY SYSTEMS

Amiram Ron Sept. 1962 51 p 25 refs
(Contract AT(30-1)-1238)
(MATT-134)

A dielectric function is introduced for classical systems of many interacting particles in terms of the N-particle distribution function in phase space. The system is considered as a whole, using the Liouville equation instead of the canonical equations of the B-B-G-K-Y hierarchy. To facilitate the calculation, the diagrammatic technique of Prigogine and Balescu is introduced, in which terms a systematic asymptotic analysis is carried out for two simple cases: (1) a system of weak interaction and (2) a simple model of plasma. The treatment is restricted to systems in thermal equilibrium. Author

N63-11705 Princeton, U. Plasma Physics Lab., N.J.

A PROBE SYSTEM FOR STELLARATOR PLASMA RESEARCH

J. M. Chapuk, V. L. Corso, V. S. Foote, W. L. Harries, R. M. Sinclair, J. L. Upham, and S. Yoshikawa June 1962 43 p 6 refs
(Contract AT(30-1)-1238)
(MATT-139)

A Langmuir probe system is described which operates in high-temperature (50 ev), high-density (3×10^{13} cm^{-3}), stellarator-pulsed discharges with plasma currents of up to 10 ka (current density of 150 A/cm^2) in confining fields of up to 50 kgauss. Experimental results are shown of probe ion current vs time, and position, and also of plasma density profiles perpendicular to the stellarator axis. Calculated average plasma densities from these profiles are about 20% higher than those measured in a 4-mm microwave system. The current-voltage traces show approximately Maxwellian electron-energy distributions, and give temperature as a function of position and time. The space-averaged values at given times about twice as high as estimated from the plasma conductivity. Author

N63-11706 Princeton U. Plasma Physics Lab., N.J.

SOME INVESTIGATIONS OF PLASMA INSTABILITIES IN ONE-DIMENSIONAL PLASMAS

John Dawson and Craig Smith (Ph. D. Thesis) Nov. 1962 44 p 9 refs
(Contract AT(30-1)-1238)
(MATT-152)

A summary of some investigations of plasma instabilities on one-dimensional plasma is given. Three unstable situations are considered: (1) the double stream instability in which two cold streams of electrons pass through each other and through a fixed neutralizing background; (2) and (3) current instabilities in which an electron current is passed through a two species plasma. For case (2), the electron streaming velocity was less than the thermal velocity of the electrons, while for case (3) it was greater than the thermal speed of the electrons. The ion sheets were cold for both cases (2) and (3), and an external field was applied to keep the current constant. For the double-stream and high-current cases, violent instabilities were observed which led to rapid breakup of the streams for the double-stream case, and to rapid heating of the plasma for the high-current case. For the low-current case, the plasma quickly stabilized itself and there was little indication that the plasma had been unstable. Author

N63-11708 Princeton U. Plasma Physics Lab., N.J.

ON THE EFFECT OF A TRANSVERSE MAGNETIC FIELD ON THE EQUILIBRIUM OF A CURRENT CARRYING TOROIDAL PLASMA. I. THEORETICAL

S. Yoshikawa, R. M. Sinclair, J. O. Kessler, and W. L. Harries Dec. 1962 27 p 11 refs
(Contract AT(30-1)-1238)
(MATT-155)

The current-carrying toroidal plasma confined in a stellarator magnetic field can be brought into equilibrium by means of a suitably chosen vertical (perpendicular to the plane of the stellarator) magnetic field, even without externally imposed rotational transform. From a macroscopic point of view, the expanding force acting on the plasma ring arises partly from the nonuniformity of the main confining field and partly from the self-interaction of the ohmic heating current (hoop force). This force can be compensated by the ponderomotive force arising from an externally applied vertical magnetic field crossed with ohmic heating current. Microscopically, the charge separation, arising from the U-bend drift and magnetic field nonuniformity produced by the ohmic heating current, is cancelled by a perpendicular component of ohmic heating current which results from the vertical magnetic field imposed. Both derivations result in the same magnetic field necessary to put the plasma in equilibrium. The effects of helical magnetic fields, both as applied externally and as determined by the plasma current, are derived for the case in which the plasma configuration is determined by an aperture limiter. It is shown

that under these circumstances rotational transform is equivalent to externally applied vertical magnetic field, insofar as charge separation cancellation and plasma equilibrium are concerned. Author

N63-11709 Northeastern U., Boston, Mass.
CALCULATION OF THERMOPOWER FACTORS FOR A PLASMA AND A METAL Scientific Report No. 3
Jack Davis and Giovanni Lonza Nov. 1, 1962 13 p 4 refs
(Contracts AF 19(604)-7358; AF 19(604)-8462)
(AFCRL-62-1047)

The thermopower factors for a plasma and a metal are calculated so that the relative efficiency of a plasma thermocouple may be determined. It is assumed that the plasma can be described by Boltzmann statistics while the electron gas in a metal is characterized by Fermi statistics. The electron gas, in the case of the metal, is considered from the free electron theory point of view, neglecting phenon drag and inelastic scattering processes. The flow of heat may not be equal to the flux of energy. Also, the thermopower factor for a plasma is much larger that the corresponding value for a metal. J.R.C.

N63-11719 General Electric Co. Research Lab., Schenectady, N.Y.
STUDY OF THE INTERACTION BETWEEN ELECTROMAGNETIC FIELDS AND PLASMAS Final Report for the Period Oct. 1, 1961-Oct. 1, 1962
K. B. Persson and J. M. Anderson Sept. 15, 1962 77 p 22 refs
(Contract AF 19(628)-247)
(AFCRL-62-906)

A pulsed, low-frequency bridge, where interaction with a plasma column is by a solenoidal electric field, is utilized to measure the decaying conductivity following a pulsed electrical discharge in xenon and krypton. Attainment of a minimum residual gas pressure in the vacuum system $\sim 5 \times 10^{-11}$ Torr with an oil diffusion pump and traps of alumina pellets is described. A theoretical treatment of nonlinear ambipolar diffusion indicates that the limiting velocity for electron-ion flow is the isothermal or adiabatic sound velocity as found at the exit of a nozzle. Bohm's criterion is a natural consequence of this theory. The Hall effect in the positive column established in helium, neon, and argon is examined, and the electron drift velocity, so found, compares favorably with other independent determinations. Author

N63-11882 Michigan U., Ann Arbor
BOUNDARY VALUE PROBLEMS IN PLASMA OSCILLATIONS
Fred Charles Shure [1962] 116 p 31 refs
(Partially supported by ONR)

A unified treatment is presented for boundary value problems involving a system of ionized particles (plasma) whose singlet phase-space density is presumed to satisfy the linearized form of the Landau-Vlasov equations. Specifically, a normal mode expansion in the singular eigenfunctions of the coupled Maxwell and Landau-Vlasov equations is used. The eigenfunction expansion is applied to solve boundary value problems in plasma oscillations. The equations treated contain a continuous spectrum of allowed values with associated singular normal modes. The eigenfunction expansion for plasma problems does not differ from the eigenfunction expansions that arise in all branches of physics. A.S.

25 PHYSICS, SOLID-STATE

Includes: semiconductor theory; and masers.

For related information see: 09 Electronics; 23 Physics, General; and 24 Physics, Plasma.

N63-11565 Colorado U., Boulder
MAGNETIC FIELD INDUCED NEGATIVE RESISTANCE IN n-InSb Interim Technical Report No. 1
Robert J. Phelan, Jr. May 1962 63 p 38 refs
(Grant DA-ARO(D)-31-124-G96)
(AROD-2238-5)

A negative-resistance characteristic in n-InSb, at liquid-helium temperatures, in transverse and longitudinal magnetic fields has been observed. The negative-resistance characteristic is attributed to impact ionization of impurities and supported by variations of the Hall coefficient with the applied current. In addition, time delays, rise and decay times for the current have been studied, and an explanation in terms of the rate equation for ionization and recombination has been developed. The negative-resistance characteristic has been used to generate oscillations, and, utilizing the control of the magnetic field, a crystal has performed as both a four- and a two-terminal switch. Author

N63-11653 Massachusetts Inst. of Tech. Solid-State and Molecular Theory Group, Cambridge
QUARTERLY PROGRESS REPORT NUMBER 45 [SOLID STATE AND MOLECULAR PHYSICS]
J. C. Slater et al July 15, 1962 123 p 141 refs
(Contracts Nonr-1841(34) and AF 19(604)-8445; Grant NSF-G-10821; Lincoln Lab. P. O. C-00663)

Progress is reported in the following areas: magnetic and spectroscopic properties of rare-earth ions; neutron magnetic form factors and X-ray atomic scattering factors for rare-earth ions; exchange splittings of L-S multiplets or rare-earth ions in crystals; atomic many-body problem; energy bands for the iron transition series; energy band calculations; H_2-H_2 interaction; and adiabatic approximations and superconductivity theories. R.C.M.

N63-11657 Naval Research Lab., Washington, D.C.
ELECTROFRACTURE
J. W. Davisson and W. H. Vaughan *In its* Report of NRL Progress Dec. 1962 p 7-17 4 refs (See N63-11655 04-01) OTS: $1.25

The electrofracture patterns in a number of crystals are discussed including MgO, $NaBrO_3$, ADP, $NaNO_3$, calcite, and the alkali halides. Cubic cleavage was observed in the electrofracture pattern of $NaBrO_3$. Unusual electrofracture patterns were observed in ADP and in $NaNO_3$ crystals. Author

N63-11669 Tyco, Inc., Waltham, Mass.
THE TRAVELLING SOLVENT METHOD OF CRYSTAL GROWTH Quarterly Report No. 4, February 15 thru May 15, 1962
M. Weinstein, S. D. Axelrod, and A. I. Mlavsky June 14, 1962 20 p 1 ref
(Contract AF 19(604)-8803)
(AFCRL-62-503)

Progress is reported in the following areas: Hall effect and resistivity measurements of SiC; deposition of Cr from chromium dicumene; electron beam melting of Cr on SiC; wetting studies of Cr on SiC; etching studies in molten salts; zone movement studies; p-n junction formation of the Ga-GaAs system by solvent doping. R.C.M.

N63-11739 Naval Ordnance Test Station, China Lake, Calif.
THREE RUSSIAN ARTICLES ON DIFFRACTION OF SLOW ELECTRONS IN GRAPHITE, ZINC, AND ALUMINUM
V. E. Lashkarev et al Aug. 1962 49 p 38 refs Transl. by Marvin E. Backman from "Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki", 1933-1939
(NOTS-TP-2984; NAVWEPS-7947)

Because of the recent increase in research on the diffraction of slow electrons, the Russian articles in this report are of current interest.

Publication occurred during another period (1933-1939) of high interest in the field, and the titles are as follows: Diffraction of Electrons in Single Crystals of Graphite, Diffraction of Slow Electrons in Single Crystals of Zinc, and Diffraction of Slow Electrons in Single Crystals of Aluminum. Author

N63-11784 Raytheen Co. Research Div., Waltham, Mass.
INVESTIGATION OF EFFECTS OF ION-INDUCED DEFECTS ON SURFACE REACTIONS. THE SPUTTERING OF COMPOUNDS Scientific Report No. 2
S. Wolsky, D. Shooter, and E. J. Zdanuk Sept. 20, 1962 16 p 22 refs
(Contract AF 19(604)-8004)
(S-472; AFCRL-62-935)

Sputtering yield data, atom ejection patterns, and sputtered film composition support a molecular sputtering mechanism of GaSb. The surface structure models used to explain the atom ejection patterns are discussed. Selective sputtering of Ga was noted. Considerable information was obtained concerning the sputtering of diamond structure materials. Author

N63-11807 Advanced Technology Labs. Div. of American-Standard, Mountain View, Calif.
RESEARCH ON DIFFUSION OF HYDROGEN THROUGH PALLADIUM Quarterly Progress Report, Jan.-Apr. 1962
R. E. Corridan [1962] 14 p 3 refs
(NASA Contract NAS7-118)
(ATL-D-786) OTS: $1.10 ph, $0.80 mf

A review of recent literature on diffusion of hydrogen through palladium was completed, and, on the basis of material gathered during this survey and the earlier experience of ATL, the parameters of interest were established and test sequences and procedures formulated. Permeability test apparatus was designed, fabricated, and checked for performance. The test program has commenced with the investigation of average steady-flow rates as a function of (1) palladium tubing temperature, (2) palladium tubing wall thickness, and (3) pressure drop across the palladium tubing. Author

26 PROPELLANTS AND COMBUSTION

Includes: fuels; igniters; and oxidizers.

For related information see: 07 Chemistry; and 27 Propulsion.

N63-11569 Rocketdyne, Canoga Park, Calif.
PROPELLANTS FOR ELECTRICAL PROPULSION ENGINES OF THE CONTACT OR BOMBARDMENT ION TYPE SECOND ANNUAL (FINAL) REPORT
V. E. Bedwell et al Wright-Patterson AFB, Ohio, Directorate of Materials and Processes, Nov. 16, 1962 137 p 47 refs
(Contract AF 33(616)-7063)
(R-3556; ASD-TR-61-150, Pt. II)

Materials and methods are investigated for producing molecular ions and a colloidal ion beam suitable for use in electrical propulsion devices. The molecular compounds were selected for study primarily on a basis of expected favorable ionization characteristics and high structural stability to fragmentation. Limiting stable molecular structures were found for several classes of compounds. The experimental techniques for determining physical and chemical properties of candidate materials are outlined, and the experimental results are combined with data from the literature to complete the propellant study program. A theoretical analysis of a colloid-producing system which utilizes a convergent-divergent nozzle for rapid condensation of propellants is presented. Equations are given which may be used to optimize the design and operation of a system which produces colloidal particles from condensable vapors. Electrical charging of the droplets is accomplished by ionizing a fraction of the propellant vapor prior to expansion through the nozzle. A graphical approach for obtaining approximate thermodynamic conditions necessary to adiabatically condense propellant vapors in a typical colloid-generating system is introduced. Experimental results from operation of a charged, mercury colloid generator are presented. The theoretical and graphical methods may be extended to other propellants if they possess suitable thermodynamic and physical properties. Author

N63-11616 National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
RELATIVE IGNITABILITY OF TYPICAL SOLID PROPELLANTS WITH CHLORINE TRIFLUORIDE
Harrison Allen, Jr., and Murray L. Pinns Washington, NASA, Jan. 1963 24 p 2 refs
(NASA TN D-1533) OTS: $0.75

Ignition delays were measured after exposing samples of solid propellants and their components to the hypergolic fluid, chlorine trifluoride (ClF_3), in both the liquid and the gas phases. A comparison of these ignition-delay data serves as a measure of the relative reactivity of these propellant compositions with ClF_3. The gas-phase studies showed that the ignition delay varied exponentially with ClF_3 pressure and approached a limit of less than 50 milliseconds at 14 pounds per square inch absolute, the maximum pressure permitted by the experimental apparatus. The gas-phase studies also revealed that the reactivity of the propellant formulation was greatly affected by changes in concentrations of the dispersed solid components (ammonium perchlorate and aluminum) of the propellant. After reaching a minimum point, the ignition delay of the propellant increased with an increase in the concentration of the ammonium perchlorate component; with an increase in the concentration of the aluminum component, the ignition delay was decreased. All the propellant formulations were extremely reactive with liquid ClF_3 and had ignition delays of less than 3 milliseconds. Author

N63-11618 National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio
EFFECT OF THE ACCELERATION DISTURBANCES ENCOUNTERED IN THE MA-7 SPACECRAFT ON THE LIQUID-VAPOR INTERFACE IN A BAFFLED TANK DURING WEIGHTLESSNESS
Donald A. Petrash, Ralph C. Nussle, and Edward W. Otto Washington, NASA, Jan. 1963 15 p 2 refs
(NASA TN D-1577) OTS: $0.50

The acceleration disturbances imposed upon the experimental tank during spacecraft orientation maneuvers in orbit had no effect on the steady-state liquid-vapor interface configuration. The steady-state configuration is one in which the baffle is completely full, and the remaining liquid is uniformly distributed at the base of the standpipe. Control of the liquid-vapor interface was lost by the surface-tension baffle as the spacecraft passed through 0.30g during reentry into the earth's atmosphere. Author

N63-11757 Bureau of Mines. Explosives Research Lab., Pittsburgh, Pa.
INITIATION OF DETONATION RESULTING FROM COMBUSTION INSTABILITIES Quarterly Report, Aug. 1, 1962 to Oct. 31, 1962
F. C. Gibson, R. W. Watson, C. R. Summers, and F. H. Scott Jan. 9, 1963 20 p refs
(ARPA Order 44-62, Amend. 5)

Experimental work being done to determine the minimum shock pressure required to produce a high-order detonation in nitroglycerin-ethylene glycoldinitrate (NG-EGDN) as a function of initial temperature is described. The magnitude of the pressure pulse delivered to the explosive is determined from initial shock-velocity measurements and calibration data obtained by the water-aquarium technique. The shock velocities are obtained from streak-camera records of the shock front as it enters the liquid in the aquarium; other aspects of the tests are recorded simultaneously by means of a high-speed framing camera. Preliminary studies carried out at ambient temperature (25° C) led to the conclusion that peak pressures of the order of 60 kilobars were inadequate for the direct initiation of a high-order detonation in NG-EGDN experiments. These results have been extended to include trials at 50° C and 75° C. A.S.

N63-11767 European Atomic Energy Community, Brussels (Belgium)

ÉTUDE DU TRANSPORT VERS LES ÉTATS-UNIS DES COMBUSTIBLES IRRADIÉS DANS LES RÉACTEURS DE PUISSANCE EUROPÉENS. VOL. I. [STUDY OF IRRADIATED FUELS SHIPMENT FROM THE EUROPEAN POWER REACTORS TO THE UNITED STATES. VOL. 1]

Jacques Iliovici (Groupe d'Études Nucléaires LEBON-SOGEI, Paris) et al Groupe d'Études Nucléaires LEBON-SOGEI, Paris, [Nov.] 1962 37 p In French; English summary For Vol. 3 see N63-11768 04-26

(Contracts AT(11.1)-963 and EURATOM 043-61.2 RDF; Joint EURATOM-United States Program)

(EUR-112.e,f) Available from Belgian American Bank and Trust Co., N.Y., account No. 121.86; 30 Belg. Fr.

On November 8, 1958, the European Energy Community (Euratom) and the United States of America signed an Agreement for Cooperation to develop the peaceful applications of atomic energy. This Agreement provides for the construction in Europe of a certain number of power reactors intended for producing electric energy of nuclear origin. Author

N63-11768 European Atomic Energy Community, Brussels (Belgium)

ÉTUDE DU TRANSPORT VERS LES ÉTATS-UNIS DES COMBUSTIBLES IRRADIÉS DANS LES RÉACTEURS DE PUISSANCE EUROPÉENS, VOL. 3 [STUDY OF IRRADIATED FUELS SHIPMENT FROM THE EUROPEAN POWER REACTORS TO THE UNITED STATES, VOL. 3]

Jacques Iliovici (Groupe d'Études Nucléaires LEBON-SOGEI, Paris) et al Groupe d'Études Nucléaires LEBON-SOGEI, Paris, [Nov.] 1962 512 p In French; English summary For abstract see Vol. I, N63-11767 04-26

(Contracts AT(11.1)-963 and EURATOM 043-61.2 RDF; Joint EURATOM-United States Program)

(EUR-112.e,f) Available from Belgian American Bank and Trust Co., N.Y., account No. 121.86; 30 Belg. Fr.

N63-11878 Atlantic Research Corp., Alexandria, Va.

HAZARDS OF LIQUID HYDROGEN IN RESEARCH AND DEVELOPMENT FACILITIES [Final] Technical Documentary Report [May 1-Nov. 1, 1962]

Guenther von Elbe and Howard T. Scott, Jr. Wright-Patterson AFB, Ohio, Directorate of Aeromechanics, Dec. 1962 81 p 27 refs

(Contract AF 33(657)-8952)

(ASD-TDR-62-1027)

The physical and chemical properties of hydrogen have been summarized with emphasis on the relation of these properties to combustion and detonation processes, and information has been collected on experiences and practices in numerous facilities. Hazards comprise the possibility of pressure rupture of containers, initiation of flammable mixtures formed by release of hydrogen due to vessel failure or other causes, and explosion of hydrogen and contaminating oxygen under cryogenic conditions. It is shown that the theory of chemical reaction provides a complete understanding of the combustion and detonation characteristics of hydrogen-oxygen systems and defines the chemical and physical requirements for inhibition and control of combustion and detonations. Experiences and practices in research and development facilities have been reviewed, and subjects warranting further investigation have been determined. Author

27 PROPULSION

Includes: airbreathing, electric, liquid, nuclear, and solid propulsion.

For related information see: 04 Aircraft; 06 Auxiliary Systems; 26 Propellants and Combustion; and 30 Space Vehicles.

N63-11759 Rocketdyne, Canoga Park, Calif.

MODEL SPECIFICATION, ROCKET ENGINE PROPULSION SYSTEM, ROCKETDYNE MODEL MA-5

J. S. Rose [1962] 170 p refs Bound together with Specification Change Notices 1, 2, 5 - 7, 9, 10

(Contract AF 04(694)-58)

(R-2850aS)

This report on rocket engine propulsion system model MA-5 covers the following: model specification and engine operating regimes; high- and low-pressure pneumatic requirements; quality assurance provisions; packaging, storage, and delivery. J.R.C.

N63-11781 National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

PERIGEE PROPULSION FOR ORBITAL LAUNCH OF NUCLEAR ROCKETS

Paul G. Johnson and Frank E. Rom Washington, NASA, 1962 26 p 11 refs

(NASA TR R-140) GPO: $0.40

A thrust program, called perigee propulsion, which minimizes gravity loss is analyzed. Thrust is applied intermittently in regions of high velocity (near successive perigees). The increased energy-addition efficiency yields mass ratios approaching those for impulsive velocity change. Corresponding times to reach desired energy are in days; but are still small relative to mission times. For specified orbital-launch missions, perigee-propulsion nuclear rocket systems are shown to equal continuous-thrust performance, with reactor powers an order of magnitude less than those of continuous-thrust systems. Application and operational aspects of perigee propulsion are discussed. Author

N63-11857 Aro, Inc., Arnold Air Force Station, Tenn.

ZERO SECONDARY FLOW EJECTOR-DIFFUSER PERFORMANCE USING ANNULAR NOZZLES

R. C. German, J. H. Panesci, and H. K. Clark Arnold Engineering Development Center, Jan. 1963 46 p 7 refs

(Contract AF 40(600)-1000)

(AEDC-TDR-62-196)

An investigation was conducted to determine the performance of zero-secondary flow ejector-diffuser systems using annular driving nozzles. Eight annular nozzles with various geometries, including one expansion-deflection (E-D) nozzle were tested in cylindrical diffusers

having various diffuser lengths. The ejector starting and pumping characteristics were compared and found similar to the empirical relations developed for ejectors having conventional convergent-divergent nozzles. The unique problems associated with simulated altitude testing of the E-D nozzle and the effects of ejector-diffuser design on E-D nozzle performance are discussed. A method is described for determining the ejector pumping characteristics when the ejector is unstarted to satisfy the annular nozzle test requirement for altitude simulation at conditions other than minimum cell pressure. Author

N63-11886 Naval Ordnance Test Station, China Lake, Calif.
THERMAL UNDERWATER POWER PLANTS Technical Article 17
James H. Green Nov. 1962 9 p
(NOTS-TP-2876)

Some of the problems are discussed that are involved in the design of chemically fueled thermal propulsion plants for torpedo design, and some possible solutions are presented. The state of the art is outlined. Author

N63-11931 Southwest Research Inst., San Antonio, Tex.
STUDIES OF INTERNAL DISPLACEMENTS IN SOLID PROPELLANT GRAINS (DISPLACEMENTS IN CYLINDRICAL, UNFILLED-URETHANE SPECIMENS UNDER UNIAXIAL COMPRESSION) Interim Report
L. U. Rastrelli and R. C. De Hart Oct. 1, 1962 58 p 6 refs
(Contract Nonr-3363(00)(FBM))

Surface and internal longitudinal and radial displacement data, as acquired by using the embedded-particle technique, are presented for cylindrical models subjected to uniaxial compression loadings. Minor deviations from the predicted longitudinal and radial displacement linearity for axially symmetric conditions are noted. The material moduli and the model's volumetric behavior based on actual displacement measurements are also presented. Author

N63-11932 Southwest Research Inst., San Antonio, Tex.
STUDIES OF INTERNAL DISPLACEMENTS IN SOLID PROPELLANT GRAINS (SURFACE STRAINS IN CASE-BONDED, MODELS OF ROCKET MOTORS) Interim Report
Douglas Bynum, Jr., and Leonard U. Rastrelli Oct. 10, 1962 37 p 8 refs
(Contract Nonr-3363(00)(FBM))

Strain measurements on the case of rocket engine models with applied loads were made with electric-resistance-type strain gages, enabling the computation of case surface stresses. The model consisted of an aluminum case and a viscoelastic grain. A model having a circular-shaped grain was tested first with an applied internal pressure and then was tested to failure with an applied axial load, uniformly distributed. A model having a star-shaped grain was loaded with an applied internal pressure until a failure by rupturing occurred. Author

28 SPACE RADIATION

Includes: cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts.

For related information see: 05 Astronomy and Astrophysics; 16 Life Sciences; and 29 Space Sciences.

N63-11577 National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DISCUSSION OF PAPER BY PIZZELLA, MC ILWAIN, AND VAN ALLEN "TIME VARIATIONS OF INTENSITY IN THE EARTH'S INNER RADIATION ZONE, OCTOBER 1959 THROUGH DECEMBER 1960"
W. N. Hess Repr. from J. Geophys. Research, v. 67, no. 12, Nov. 1962, p 4886-4887 5 refs

The conclusions about the time variation in the inner radiation zone drawn by Pizella, McIlwain and Van Allen on the basis of data from Explorer VII are discussed, and evidence is presented to prove that a completely different set of conclusions can be drawn from the same data. The steady increase observed on Explorer VII for $L<1.6$ is considered to be an expected solar-cycle change due to the change in the galactic cosmic-ray proton flux and exospheric density, and the stepwise changes observed for $L>1.6$ are attributed to polar cap neutrons. Therefore, there is no need to introduce a new particle source to explain the observed time variations on Explorer VII. M.P.G.

N63-11789 Minnesota U. School of Physics, Minneapolis
OBSERVATIONS OF THE VAN ALLEN RADIATION REGIONS DURING AUGUST AND SEPTEMBER 1959 5. VISUAL AURORAS, HIGH-ALTITUDE X-RAY BURSTS, AND SIMULTANEOUS SATELLITE OBSERVATIONS
R. L. Arnoldy, R. A. Hoffman, J. R. Winckler, and S.-I. Akasofu (Alaska U.) Sept 1962 Repr. from J. Geophys. Research, v. 67, no. 10, Sept. 1962 p 3673-3686 19 refs
(NASA Contract NASw-56)
(CR-53)

The measurements made in the outer trapped radiation region by the University of Minnesota ionization chamber and Geiger counter and the scintillation counter furnished by Space Technology Laboratories, Inc., aboard the Explorer 6 earth satellite during the August 16, 1959, magnetic storm are studied. The variations in the detector rates are correlated with the visual aurora recorded by all-sky cameras and with high-altitude X-ray bursts observed by balloon-borne detectors. An increase in radiation observed at a geocentric range of 42,000 km simultaneously with the occurrence of a visual aurora on the electron shell connecting with the satellite measurements suggests that the aurora is associated with a disturbance extending over many degrees of longitude and out to large ranges. Furthermore, a rapid decrease in the Geiger counter rate coincident with a strong low-latitude aurora at Fargo, North Dakota, indicates that energetic radiation is either precipitated out of the outer zone during strong auroras or decelerated by a perturbation of the earth's magnetic field accompanying the aurora. Frequent observations of rate variations at the outer edge of the trapped radiation and at apogee point out the great instability there that results in the frequent discharge of radiation into the atmosphere observed by balloon-borne detectors at the high latitudes connecting with the region. The close correlation of outer-zone intensity variations and solar phenomena indicates that the energy involved in the dynamics of the trapping region has a solar origin. Author

N63-11888 Iowa State U., Iowa City
INTENSITY OF ELECTRONS IN THE EARTH'S INNER RADIATION ZONE
L. A. Frank and J. A. Van Allen Dec. 1962 21 p 9 refs
(NASA Grant NsG-233-62; Contract N9onr-93803)
(SUI-62-27) OTS: $2.60 ph, $0.83 mf

The intensities of electrons, as measured with the S.U.I. satellite Injun I during its deepest penetrations into the earth's inner radiation zone, are reported for the period July 16 to August 10, 1961. The unidirectional intensity of electrons of energy greater than 40 Kev was 5×10^4 electrons/cm^2 sec. steradian in a direction perpendicular to B at $L = 1.22$ in the magnetic equatorial plane. The corresponding omnidirectional intensity is estimated to be 1×10^7 /cm^2 sec. No temporal variations greater than the experimental uncertainty of 30% were found in this region during the period of observation. Author

29 SPACE SCIENCES

Includes: space chemistry; cosmology; lunar and planetary exploration; and theoretical analysis of orbits and trajectories.

For space biology see: 16 Life Sciences.

For related information see: 05 Astronomy and Astrophysics; 12 Geophysics; and 22 Navigation and Guidance.

N63-11609 National Aeronautics and Space Administration, Washington, D.C.

VELOCITY AND ENERGY OF THE TUNGUSK METEORITE

K. P. Stanyukovich and V. A. Bronshten Dec. 1962 8 p 13 refs Transl. of "O skorosti i energii Tungusskogo meteorita" from Doklady Akad. Nauk. SSSR, v. 140, no. 3, 1961 p 583-586
(NASA TT F-89) OTS: $0.50

On the basis of physical phenomena observed following the fall of the Tungusk meteorite, estimates are made of its energy and velocity. Possible explanations of the explosion that occurred during the fall of the meteorite are included. Author

N63-11611 National Aeronautics and Space Administration, Washington, D.C.

ON THE QUESTION OF THE ORIGIN OF TEKTITES

I. Ye. Starik, E. V. Sobotovich, M. M. Shats, and S. M. Grashchenko Dec. 1962 11 p 18 refs Transl. by John F. Holman and Co., Inc. of "K voprosu o proiskhozhdenii tektitov" from Meteoritika (USSR), issue. 22, 1962 p 97-102
(NASA TT F-113) OTS: $0.50

The question of the origin of tektites is approached through mathematical analysis of the data concerning the concentration of uranium and lead in samples and the isotopic composition of the lead. This type of analysis permits a closer approach to an understanding of the processes which occurred during the formation of tektites, and a fixing of the time at which they separated from their source material. Author

N63-11613 National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

OPTIMUM LOW-ACCELERATION TRAJECTORIES FOR INTERPLANETARY TRANSFERS

Arthur V. Zimmerman, John S. Mackay, and Leonard G. Rossa Washington, NASA, Jan. 1963 41 p 8 refs
(NASA TN D-1456) OTS: $1.00

Methods of the calculus of variations are applied to the problem of minimizing propellant consumption for interplanetary transfers with a constant thrust and specific impulse, low-acceleration engine. On-off operation of the engine is permitted. The necessary conditions are developed and discussed for two-dimensional, planar transfer in an inverse-square gravitational field. Numerical results for Earth-Mars and Mars-Earth transfers are used to discuss the effects of initial thrust-to-weight ratio, specific impulse, travel time, and travel angle on the final mass. A performance map for one set of engine parameters is used to illustrate a graphical procedure for optimum-round-trip calculations. Author

N63-11615 National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio

ANALOG STUDY OF DESCENTS FROM LUNAR ORBIT

Joseph N. Sivo and Carl E. Campbell Washington, NASA, Dec. 1962 25 p 7 refs
(NASA TN D-1530) OTS: $0.75

An analog study of open-loop soft lunar landings from circular orbit was made to determine the effects of orbit altitude, retrothrust magnitude and direction, and techniques of retrothrust staging on propellant consumption, range, and velocity components near touchdown. Descents to the surface were investigated over a range of orbit altitudes to 300,000 feet and a range of thrust/earth-weight ratios to 1.5 for various thrust-vector directions relative to the velocity vector. Both continuous thrust and two-stage thrusting modes were used. Author

N63-11823 Smithsonian Astrophysical Observatory, Cambridge, Mass.

THE TRAJECTORY OF TEKTITES

Gerald S. Hawkins (Boston U.) and Shoshana K. Rosenthal (Harvard Coll. Observatory) Sept. 28, 1962 18 p 8 refs
(NSF Grant G-20135)
(SAO Special Rept. 105)

The flight forms show that some, but not all tektites have traveled at hypersonic velocities through the earth's atmosphere. Bjork (1961) has shown by computer techniques that a meteorite with a mass of some 10^{12} grams, striking the earth with a velocity of 20 km/sec., makes a considerable impression on the earth's surface. A crater some 10 km in diameter is produced and much of the material at the precrater surface is ejected upwards at various angles with velocities approaching that of impact. This material is used to ascertain the time of flight and the range of the ejected debris, since it is presumed that debris contains the fused tektite glass. Author

30 SPACE VEHICLES

Includes: launch vehicle—spacecraft combinations; operating problems; and stability and control.

For manned space capsules, satellites, and space probes see: 32 Space Vehicles (Spacecraft).

For boosters and rockets see: 31 Space Vehicles (Launch Vehicles).

For related information see: 04 Aircraft; 08 Communication; and 22 Navigation and Guidance.

N63-11735 Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.

TRANSIT TESTING PROCEDURES INCLUDING ENVIRONMENTAL CONDITIONS FOR PAYLOAD EQUIPMENT AND ASSEMBLED PAYLOADS

M. A. Schreiber May 1962 (Rev.) 29 p
(Contract NOw-62-0604-C)
(TG-416-A; supersedes TG-416)

Procedures and environments are established for testing the electronic equipment and assembled payload of the Transit satellites. These tests are formulated specifically to establish the ability of the equipment to withstand, without performance degradation, storage, handling, transportation, prelaunch and launch operations, orbital injection, and sustained orbit. The environmental conditions for which test procedures are presented include vibration, shock, sustained acceleration, temperature variation, vacuum, humidity, and spin and despin. Criteria for satisfactory performance under these conditions are also established. M.P.G.

31 SPACE VEHICLES (LAUNCH VEHICLES)

Includes: boosters; clustered rockets; and multistage rockets.

For propulsion engines see: 27 Propulsion.

For launch vehicle - spacecraft combinations see: 30 Space Vehicles.

For related information see: 04 Aircraft; 08 Communications; and 22 Navigation and Guidance.

No abstracts in this issue.

32 SPACE VEHICLES (SPACECRAFT)

Includes: manned space capsules; satellites; and space probes.

For boosters and rockets see: 31 Space Vehicles (Launch Vehicles).

For Launch vehicle—spacecraft combinations see: 30 Space Vehicles.

For related information see: 04 Aircraft; 08 Communications; and 22 Navigation and Guidance.

No abstracts in this issue.

33 STRESSES AND LOADS

Includes: fatigue; vibration; flutter; and structural tests.

For related information see: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings and Control Surfaces; and 34 Structural Design.

N63-11560 California U., Berkeley. Inst. of Engineering Research
ON THE NONLINEAR THEORY OF ELASTIC SHELLS UNDER THE KIRCHHOFF HYPOTHESIS
P. M. Naghdi and R. P. Nordgren Aug. 1962 19 p 15 refs
(Contract Nonr-222(69))
(IER Ser. 131, Issue 17)

An exact, complete, and fully general nonlinear theory of elastic shells, founded under the Kirchhoff hypothesis, is presented. Beginning with the three-dimensional field equations, suitable strain measures are determined, and the fully nonlinear constitutive equations are derived according to Green. An alternative derivation of these constitutive equations by direct integration of the constitutive relations of the nonlinear theory of hyperelastic materials in 3-space is carried out and reduced to corresponding results for the linear theory. Finally, the nature of the kinematic approximations often adopted in contemporary studies is discussed, with special reference to the axisymmetric deformation of shells of revolution in order to determine precisely the position of the approximate theory relative to the exact theory.
M.P.G.

N63-11574 Brown U. Div. of Engineering, Providence, R.I.
EXPERIMENTAL STUDY OF THE DYNAMIC MODULUS OF ALUMINUM IN THE PRESENCE OF CREEP
S. R. Bodner and C. L. Amba Rao Nov. 1962 16 p 6 refs
(Contract Nonr-562) (20)
(Tech. Rept. 32)

An experimental study on the interaction of tensile creep and low-amplitude lateral oscillations was performed on aluminum specimens to determine the changes in the dynamic modulus due to creep and the effect of vibrations on the creep properties. No significant changes were found to occur in either the dynamic modulus or in the creep characteristics. The dynamic formulation of creep-buckling problems is discussed in relation to these results. Author

N63-11582 California U., Berkeley. Ceramic Labs.
FORMATION AND STRENGTH OF MAGNESIA WHISKERS
Charles O. Hulse Repr. from J. Am. Ceramic Soc., v. 44, no. 11, Nov. 1961 p 572-575 9 refs
(NASA Grant NsG-72-60)
(*Its* Materials Sci. Ser. Contrib. 133; IER Repr. 12-62)

The formation of single-crystal magnesia whiskers during the compressive deformation of single crystals at room temperatures is described. These whiskers can have strengths of the order of millions of pounds per square inch. They are formed during fracture as a result of the discontinuous propagation of cracks which are mechanically relieving internal stresses resulting from plastic flow. Author

N63-11583 Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
VIBRATIONS OF POINT-DRIVEN CYLINDRICAL SHELLS
Manfred Heckl Repr. from J. Acoust. Soc. Am., v. 34, no. 10, Oct. 1962 p 1553-1557 12 refs
(NASA Contract NASr-47)

By using some approximations, it is possible to get fairly simple approximate formulas for the number of resonance frequencies and for the point impedance of thin cylinders. Measurements of the resonance frequencies, and of the number of resonances within a certain frequency range, confirm the theoretical results. Author

N63-11679 Texas U. Structural Mechanics Lab., Austin
MEASUREMENT OF PARTICLE VELOCITIES ASSOCIATED WITH WAVES PROPAGATING IN BARS Research Memorandum
E. A. Ripperger and Lester M. Yeakley [1962] 37 p 8 refs
Presented at SESA Spring Meeting, Dallas, Texas, May 16-18, 1962
(Grant DA-ARO(D)-31-124-G189)
(Paper 729; AROD-2998-1)

The measurement of longitudinal and radial particle velocities, associated with waves propagating in bars, by an electromagnetic-induction method is described. It is shown that both velocity components can be measured in conducting and nonconducting bars with approximately the same order of precision normally achieved in strain measurements. Precautions which must be observed are discussed and typical results are presented. Author

N63-11707 Princeton U. Plasma Physics Lab., N. J.
LOW CYCLE TENSILE FATIGUE TESTS OF 305 STAINLESS STEEL
Robert Mark Nov. 1962 11 p 1 ref
(Contract AT(30-1)-1238)
(MATT-154)

This report describes a series of pull-pull cyclic loading tests of type 305 stainless steel specimens to determine a number of cycles to failure *vs* stress level curve for application in the design of high magnetic field research devices. The effect of surface finish was investigated with specimens having several different common machined finishes. The test results indicate that the material will not rupture under any practical number of cycles of tension loading with

stress levels at or below the 0.2% offset yield point. For structures subjected to between 10^3 and 10^6 loading cycles, rupture should not occur below the stress level given by

$$\sigma_L = 17.5 \log \frac{10^6}{N}$$

with

σ_L = limiting stress level (ksi)

N = maximum number of load cycles.

Author

N63-11856 Aerojet-General Corp. Space Propulsion Div., Azusa, Calif.
STUDY ON BELL-MODE VIBRATIONS OF CONICAL NOZZLES [Second] Quarterly [Contract Status] Report, 16 August through 15 November 1962
D. Platus Nov. 1962 39 p 4 refs
(NASA Contract NASr-111)
(Rept. 0660-01-2) OTS: $3.60 ph, $1.37 mf

This report summarizes a general method for determining the natural frequencies of vibration of thin, truncated, conical shells rigidly fixed at one end and free at the other end. The method consists in representing the displacement mode shapes by polynomial expressions containing an arbitrary number of terms selected to satisfy the fixed-end boundary conditions. A digital-computer code has been written for evaluating the frequencies; it will also permit an estimate of the error incurred in terminating the displacement polynomials at a finite number of terms. The computation is expressed as a perturbation of a cylindrical shell so that the fixed-end free-end cylinder may be evaluated as a limiting case of the cone. An approximate method is proposed and compared with another approximate solution in an attempt to obtain a simple hand calculation which will give adequate accuracy and be more suitable than the machine calculation for predicting the normal mode vibrations of a stiffened rocket nozzle. Author

N63-11873 Columbia U., New York, N. Y.
STRESSES IN AN INCOMPRESSIBLE VISCO-ELASTIC PLASTIC THICKWALLED CYLINDER Technical Report No. 15
M. Shinozuka Nov. 1962 32 p 3 refs
(Contract Nonr-266(78))
(CU-15-62-ONR-266(78)-CE)

A method is presented of determining stresses and strains under the assumption of plane strain in an incompressible viscoelastoplastic thick-walled cylinder subject to internal pressure. For a material with deviatoric stress-strain relations characteristic of a standard solid, the numerical computation is carried out on the IBM digital computer 1620. Author

N63-11874 Columbia U., New York, N. Y.
A SHRINK FIT PROBLEM Technical Report No. 16
William R. Spillers Nov. 1962 17 p 11 refs
(Contract Nonr-266(78))
(CU-16-62-ONR-266(78)-CE)

A solution is given for the problem of a solid, symmetric, elastic cylinder which is stress-free on its surface except for a finite band over which the radial displacement is prescribed. The problem is formulated in terms of dual integral equations for which a series solution is given. The surface pressure is given for several examples. Author

N63-11911 National Aeronautical Lab., Tokyo (Japan)
ON FATIGUE CRACKS
Yukihiko Takenaka 1962 29 refs In Japanese; English abstract
(NAL-TR-28)

The plastic deformation always precedes the fatigue failure, and the portion subjected to repeated plastic deformation in the elastic matrix may play an essential role in the initiation and nonpropagation, as well as propagation, of fatigue cracks. The fatigue tests under repeated plastic strain were carried out and the following results were obtained. (1) In the earlier stage of the tests, strain hardening will progress, but subsequently the rate of stress increment will decrease gradually and the stress will saturate to a certain constant value, which corresponds to its strain amplitude. (2) The relation between plastic strain amplitude ϵ_p and the number of cycles up to fracture N is $\epsilon_p^{\alpha} N = C$ where α and C are material constants. In this paper, a new theory based on these experimental facts is proposed, which can unifyingly explain the initiation, nonpropagation, and propagation of fatigue cracks. Author

N63-11918 General Dynamics/Astronautics, San Diego, Calif.
FLEXURAL VIBRATIONS IN UNIFORM BEAM-COLUMNS ACCORDING TO THE MODIFIED TIMOSHENKO THEORY
L. L. Fontenot Feb. 1, 1962 64 p 13 refs
(ERR-AN-110)

This report concerns the analytical determination of the transient flexural vibrations of beams subjected to axial forces. Previous studies of this subject have employed both the modified Bernoulli-Euler theory and the Timoshenko theory. However, these studies have not adequately accounted for secondary effects which can affect the vibrational response. This study, employing the modified Timoshenko theory, is intended to determine the flexural vibrations in a uniform beam, accounting for the secondary effects not covered previously. The report gives general solutions of both free and forced vibrations of beams subjected to axial loads, a general solution for the case of a simply supported beam, and solutions for the case of vibrations in an infinite beam. The work represents one phase of an investigation to develop analysis methods in support of proposal efforts on large, low slenderness ratio and/or clustered tank booster vehicles. Author

34 STRUCTURAL DESIGN

Includes: structural elements; and weight analysis.

For related information see: 02 Aerodynamics of Bodies, Combinations, and Internal Flow; 03 Aerodynamics of Wings and Control Surfaces; and 33 Stresses and Loads.

N63-11654 Royal Netherlands Aircraft Factories Fokker, Amsterdam
OPTIMUM SANDWICH DESIGN
M. P. Nieuwenhuizen Sept. 1962 33 p Presented to the Fifth European Aeron. Congr., Venice, Sept. 12-15, 1962

In this report a method is given by means of which an estimation can be made of the maximum allowable axial load on a panel in cases where lateral loads are acting. In addition, an optimum design theory for minimum weight for those combined loads is given. Author

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